ANNUAL REPORT

AND

TRANSACTIONS

OF THE

PLYMOUTH INSTITUTION

AND

Devon and Cornwall

NATURAL HISTORY SOCIETY.

VOLUME IV. PART II.

1870–71.

PLYMOUTH:
W. BRENDON AND SON, 26, GEORGE STREET.
1871.

ANNUAL REPORT

The Journal of the Society would receive an increase of interest and value by the members making more frequent communications referring to local circumstances.

Old customs, habits and manners, local proverbs, charms and sayings, geological and natural history phenomena, historical and biographical facts relating to local worthies, are subjects most desirable to collect and preserve.

1870-71.

ANNUAL REPORT

OF THE

PLYMOUTH INSTITUTION

AND

Devon and Cornwall Natural History Society.

1870-71.

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"The property of the Institution, the privileges of voting, electing Members, managing the concerns, and enacting laws, are vested exclusively in the Lecturing Members."—*Law* 2.

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Weekes, Alfred, Windsor Terrace

SECRETARIES' REPORT,

1870–71.

The Secretaries beg to present to the Society a brief Report of the proceedings of the past Session.

The Papers read and discussed in the Lecture Hall are as follows:

1870.		
Oct. 6.	Inaugural Address	The President.
„ 13.	The Pre-historic Antiquities of Dartmoor	Mr. C. Spence Bate, F.R.S.
„ 20.	The Later Stoics	Rev. C. B. Symes, B.A.
„ 27.	The Exploration of the Settle Caves	Mr. W. Morrison, M.P.
Nov. 3.	Modern France, and her Revolutions	Mr. J. D. Lewis, M.P.
„ 10.	Our Food	Mr. G. Jackson.
„ 17.	Rain	Mr. W. Pengelly, F.R.S.
„ 27.	Instinct and Reason	Dr. C. Albert Hingston.
Dec. 1.	Prussia in 1866	Rev. F. E. Anthony, M.A.
„ 8.	Our Eyes	Mr. W. Square.
„ 15.	English Art in the reign of Queen Anne	Mr. J. Hine, F.R.I.B.A.
1871.		
Jan. 12.	Conversazione	
„ 19.	Karl Theodor Körner, the Soldier-poet of Germany	Mr. E. Spender.
„ 26.	The Conversion of Food into Force	Dr. C. Albert Hingston, B. Sc.
Feb. 2.	Logic—Formal and Material	Rev. J. M. Charlton, M. A.
„ 9.	Aurora Borealis	Mr. J. N. Hearder, PH.D.
„ 16.	Sulphur	Mr. R. Oxland, F.C.S.
„ 23.	The Philosophy of Tennyson, as deduced by his Works	Rev. T. W. Freckelton.
Mar. 2.	The Principles on which Ships' sail-carrying power, and steadiness in	
„ 9.	The Canadian Year Book	Mr. A. Rooker.
	a Sea-way depend	Mr. W. Froude, F.R.S. C.E.
„ 16.	Human and Brute Intelligence	Mr. F. H. Balkwill.
„ 23.	Genius and Success	Mr. R. Collier.

The attendance has been larger than usual throughout the Session; it has averaged rather more than 88 persons for each evening, not including the evening of the Conversazione. Last Session the average was 71, and the Session previous 68.

The debates have varied in interest with the subjects brought under discussion, but will bear comparison with former years.

All the appointments made in the first half of the Session were fulfilled as arranged on the card. Since Christmas, from various causes, several changes were necessary both in time and lecturer, and your Society is greatly indebted to Dr. Albert Hingston and the Rev. T. W. Freckelton for efficient help most readily and kindly rendered in supplying vacancies.

Thirty new Members and Associates have joined the Society during the year, which now includes 54 Members, 66 Associates, and 6 Junior Associates.

The weekly Journal of the Society, which was commenced last year, has been continued this year, and being appended to this Report, renders it almost unnecessary for your Secretaries to give any further details of the proceedings of the Session.

The Anniversary Meeting was held on May 1st as usual, at which Dr. Hearder exhibited some very interesting experiments with a new electrical machine which he has called the "Fulgurator," by which an electric spark of extraordinary length and intensity may be obtained. An account of its construction and capabilities are given in the Journal.

The Conversazione was held at the commencement of the Christmas Session. The Hall was decorated with paintings in oils and water-colours, some of which were commended very highly by connoisseurs. The attendance was large, and a very pleasant evening was spent, the Society being indebted to some of its own Members and their friends for choice selections of instrumental and vocal music, which were much appreciated.

Your zealous and efficient Librarian has continued his services in the Library, and thus reports:

"The Librarian reports that during the past year many volumes have been bound up and added to the works on the shelves, and that for several of them the Members of the Plymouth Institution have to thank various learned and scientific societies. To the Zoological Society of London they are greatly indebted; for not

only have they given the current numbers of their valuable "Proceedings," but have also supplied, on the application of the Librarian, their volumes for 1855, 1856, and 1858, so as to render the set in the Library complete from 1850.

"They have moreover to thank the Geological Society for the Quarterly Journal of their proceedings; the Royal Dublin Society for part 39 of their Journal; the American Smithsonian Institution for their volume for 1868; the Royal Geological Society of Ireland for a portion of their Journal; the Devon Association for their Report for 1870; the Royal Institution of Cornwall for No. xi. of their interesting Journal; the Cornwall Polytechnic Society for their Report for 1860; the Natural History Society of Northumberland and Durham for part 2 of vol. iii. of their Transactions; the Berwickshire Naturalists' Club for their Proceedings for 1870; and the Winchester and Hampshire Scientific and Literary Society for a copy of their First Report.

"Among their own Members, they have to thank Mr. Spence Bate for the Botanical portion of the Journal of the Linnæan Society, and a copy of his Memoir of the British-Roman Antiquities found in the neighbourhood of Plymouth, published in the *Archæologia*, and Mr. J. Brooking Rowe for many volumes, amongst which are a copy of Albertus Magnus de Animalibus, Rondelet des Poissons, Pennant's Arctic Zoology, 2 vols., Pennant's Indian Zoology, 1 vol., British Association Report for 1851, and the Report of the Capital Punishment Commission. The Librarian has supplied a copy of the Journal of Botany. Dr. Stratton, Deputy Inspector General, R.N., though not connected with the Society, has kindly presented a copy of his work, "The Celtic Origin of Greek and Latin."

"During the past year the Society have obtained by purchase, "Zoological Record," vols. iii. and v., the first to fill a hiatus in the set, the other in continuation of it; 9 vols. of "Annals and Magazine of Natural History," to render the work complete to the present time; Darwin's "Descent of Man," 2 vols.; and Bellamy's "Natural History of South Devon."

A complete set of the "Annual Reports" of their own Society, in the form of two handsome volumes, have been received from the binder.

"The following is a list of the serials at present subscribed for: Quarterly Journal of Science; American Journal of Science; Phi-

losophical Journal; Annals and Magazine of Natural History; Annales des Sciences Naturelles; Journal of Anatomy; Ibis; Zoologist; Entomologist; Entomologist's Monthly Magazine; Geologist; Nature; and the Athenæum.

"Three of the works reported *missing* last year have since been recovered; they are "Aristotle's History of Animals," "Schelister's History of Music," and "A Picture of Plymouth, 1812."

"He continues to hope (*vide* last Report) that some practically scientific member may yet be found both able and willing to devise a plan for heating the Library; for he assures the Society that some of the volumes are being injured by damp. He anxiously looks forward to the hearing of a Report from the Sub-Committee appointed to consider the matter some time ago."

The grateful acknowledgments of the Society have been rendered through the Curator of Antiquities to Wm. Martin, Esq., of Lee Moor, for a fine Celt found a foot under the turf near the Jamaica Inn, and an oaken spade found in an ancient tin stream works near Altarnun, Cornwall.

The Curator further reports that he has purchased a fine flint Celt of the second stone age, found under many feet of peat on Dartmoor, and described in last year's Journal by Mr. Mitchell.

(*Signed*)

FREDERIC E. ANTHONY, } Hon. Secs.
C. ALBERT HINGSTON, }

March 30th, 1871.

TREASURERS' REPORT.

1870–71.

Presented at the Annual Meeting, March 30th, 1871.

The financial position of the Plymouth Institution is satisfactory. During the past year the expenditure under the various headings into which it is usual to divide the debtor side of our Balance-sheet has been much the same as in previous years. The printing cost considerably less than last year, although in the bills are included the cost of the *Journal* and the new Catalogue of Books.

The sums received for Subscriptions of Members and Associates amount to £124 19s., as against £99 15s. last year, £102 18s. the year before, and £107 2s. for the year ending March, 1868.

The Rental has been less than in previous years, one payment only having been received from the Bankruptcy Court, the tenancy terminating in August last.

The Council has during the last year thought well to direct the payment of £50 to the Naval Bank, which now reduces the debt to £100.

(*Signed*)

ALBERT P. PROWSE,
J. BROOKING ROWE, } Treasurers.

March 30th, 1871.

AN ACCOUNT OF THE INCOME AND EXPENDITURE

OF

The Plymouth Institution and Devon and Cornwall Natural History Society,

For the Year ending 30th March, 1871.

	£	s.	d.
To Rates, Taxes, and Insurance	8	10	2
Salaries	21	13	8
Repairs	17	7	5
Lighting and Warming	18	19	5
Interest and Arrears	12	0	0
Incidentals	7	5	1
Printing	27	10	6
Conversaziones	13	17	8½
Museum	3	13	0
Library and Binding	28	19	1
Payment in reduction of Debt	50	0	0
Apparatus	1	1	0
Balance	35	15	0¾
	£246	12	1¼

	£	s.	d.
Balance due by Treasurer	66	12	10¼
By Arrears of Subscriptions	3	3	0
Sale of old Materials	0	12	9
Annual Subscriptions of Members and Associates	124	19	0
Annual Subscriptions of Junior Associates	3	3	0
Rental	47	9	6
Admissions	0	12	0
	£246	12	1¼

Examined with the Vouchers and found correct.

March 28th, 1871.

T. W. COFFIN, *Auditor.*

An ABSTRACT from the METEOROLOGICAL REGISTER, from 1st January, 1870, to 31st December, 1870, kept at the Navigation School, Gascoyne Place, Plymouth, (Lat. 50° 22½′ N., Long. 4° 7¼′ W.), by JOHN MERRIFIELD, PH.D. F.R.A.S.

MONTH.	STANDARD BAROMETER FOR MEAN LEVEL OF THE SEA, AT 32° FAH.			SELF-REGISTERING THERMOMETERS. *(Negretti and Zambra's.)*					Average Dry Bulb for Month.	Average Wet Bulb for Month.	Number of Days on which Rain or Snow fell.	Amount of Rain or Snow Water during the Month.	REMARKS.
	Maximum for Month.	Minimum for Month.	Mean for Month.	Average Minimum for Month.	Average Maximum for Month.	Average Temperature for Month.	Maximum (in shade) for Month.	Minimum for Month.					
1870.													
January .	30·534	29·171	29·964	38·4	46·2	42·3	53·5	25	41·4	39·2	19	2·820	Gale on 8th. Temperature above average.
February .	30·334	29·389	29·822	35·0	43·5	39·3	53	23	38·3	36·9	14	3·425	A very cold and wet month.
March . .	30·474	29·406	30·064	37·7	49·5	43·6	62	27	41·9	39·4	7	2·235	Average temperature.
April . .	30·494	29·456	30·200	40·0	59·0	49·5	71	29	49·4	45·9	2	·110	A fine month with light winds.
May . .	30·410	29·410	30·080	45·9	61·8	53·9	71	34	54·8	50·7	8	1·680	Temperature below the average.
June . .	30·538	29·834	30·183	52·7	69·3	61·0	79	43	62·7	56·6	3	·285	Average temp., with several very hot days.
July . .	30·331	29·746	30·010	56·9	72·5	64·7	82	46	64·8	60·0	9	1·780	Temperature above the average. [22nd.
August . .	30·214	29·646	30·013	55·5	71·8	63·7	80	46	61·8	58·8	7	1·525	Barometer steady. Thunder shower on
September .	30·488	29·354	30·074	51·5	66·2	58·8	70	43	56·6	55·2	9	1·640	On 6th, heavy thunderstorm with hail.
October . .	30·475	29·057	29·788	47·6	59·8	53·7	66	37	52·5	51·1	16	3·555	Low barometer. Long drought over on 7th. [22nd.
November .	30·490	29·208	29·809	39·5	51·5	45·5	57	28	43·3	42·6	14	2·330	Snow on 12th. Thunder and lightning
December .	30·564	29·016	29·914	32·5	42·5	37·5	55	18	36·2	35·2	10	2·715	Barometer fluctuated more than 1½ inch.
Average for the Year	30·446	29·391	29·993	44·4	57·8	51·1	66·6	33·3	50·1	47·6	118	24·145	Total Rain for Year.

The Observations are made at Eight a.m. The Instruments are supplied by the Meteorological Committee of the Royal Society, and have been compared at Kew. Rain Guage is eight inches in diameter and 26 ft. 6 in. above the ground.

PRESIDENT'S ADDRESS.

AT THE OPENING OF THE SESSION 1870-71.

I HAVE the honour to inaugurate the fifty-eighth year of the life of this Institution. Reasoning by analogy with animal life we should expect to find in our institution the phenomena presented in faltering infancy, vigorous manhood, and decrepid old age. But there is no true analogy between the life of an institution, and the life of the individual members who compose it. An institution may be better compared with an animal type, a living species, which remains from generation to generation, perpetual in the midst of mortality, permanent though the lives of its members may endure no longer than the life of the beautiful ephemera. Nature preserves her types through all the dangers that beset the individual mortals which compose them; in the words of Tennyson—

> "So careful of the type she is,
> So careless of the single life."

If the type varies, it is but by slow imperceptible degrees, not easily recognized except by the researches of the man of science and the philosopher, who, like Mr. Darwin, draws startling deductions from complicated series of observations.

Let us, then, compare our institution rather with a type than with an individual, and if in the lapse of time it vary in its characteristics, let it vary on the principle propounded by Mr. Darwin, let it vary in a direction that will afford it advantage in the struggle for life, in a direction which will tend to perpetuate its existence.

To what principle then does this institution owe its existence? To what qualities is it indebted for its present vitality? What development will it require for its future vigour?

In the year 1858 the President, Mr. J. N. Bennett, delivered an

address from this chair on the origin and progress of this institution, when he sketched its history from its birth. It derived its origin from the intellectual activity of the men of this town. Fifty-eight years have sufficed to sweep away the active intellects which were the founders of this institution, but the abstract intellectual activity remains, strengthened by time, nourished by culture, and progressing with a growth which, in comparison with the past, is rapid and vigorous.

The force therefore which called this institution into existence continues, and is cumulative. The conditions under which it had its orgin remain. The agency which has given it fifty-eight years of vitality is still active, and the future will demand a full development of all the qualities which constitute its power to succeed in the struggle for life.

It seems to me that there is a true analogy between the life of our institutions, whatever they may be, and the existence of an animal type or species. Institutions, whether they be political, scientific, or otherwise, owe their origin to circumstances, which may be compared to the circumstances from which an animal type may result. Those circumstances failing, disappearing, the animal type disappears, and we may safely predict that institutions such as this would disappear, and will disappear, if the circumstances that constitute their vital power do not continue in operation; and that they will languish if those conditions lose a particle of their energy.

I have said that this institution derived its origin from the intellectual activity of this town. According to my argument by analogy, the intellectual activity of Plymouth having in the first place summoned this institution into existence, having for fifty-eight years nourished it and enabled it to succeed in a world of universal competition, in a world in which competition seems to be an overpowering social law, it would follow that if our intellectual activity continue this institution will flourish; and conversely, if our intellectual activity subside this institution will be on the wane. Is the condition of this institution therefore an indication of the intellectual progress of Plymouth? Are we, the members now composing this institution, entitled to say that we contain within ourselves the measure of the intellect of Plymouth?

Placed in this chair as your President, to which office you have paid me the high compliment of electing me, I wish to address you

on the vital subject of the prosperity of this institution, and to invite you to consider the questions that I have propounded. Does this institution represent the intellectual condition of Plymouth? Does this institution progress and flourish in a degree corresponding to the forward movement of the intellect of the day?

I have put two questions, but I hope I may assume that they may be justly merged into one; that is to say, that the forward movement of the intellect of the day, and the intellectual condition of Plymouth may be considered as one and the same thing. I hope I may assert with confidence that Plymouth is not behind hand in the increasingly rapid advances, year after year, or even month after month, which opinion and speculation—research, experiment, and conclusion — induction and deduction, with all the various forms that mental activity takes, impel the energetic intellects of our age to make.

We must acknowledge a truth, if we desire to take our stand on our intellectual position, whether it be favourable or unfavourable to us. We are placed in the south-west of England, and doubtless, at the present time, have the peculiar characteristics for which the south-west of this country has always been distinguished. We are not wealthy. We have not iron; we have not coal-fields. We do not amass material good things in large quantities, as the men of the North do; and we hope also, that, as it seems at present to be an economical law, that the extreme of poverty shall be found in conjunction with the extreme of wealth, we may congratulate ourselves that although we are not wealthy, neither have we amongst us excessive poverty—not at any rate such distressing poverty as may be seen in the great centres of wealth. Are we, however, in a position to say, "We admit that we have not great material wealth; we rejoice that we have not excessive material poverty; but we take great pride in our intellectual advancement?" Can we say to ourselves that we have still the quality for which sweet Devon has been famous in history? for which the south-west of England has held a proud distinction? Do we still send Raleighs and Reynoldses to London,—that great, all-absorbing centre, which draws the leading spirits of the world by an irresistible centripetal force within itself?

It is well for us to consider whether, if we cannot supply our country with material, we can supply it with intellectual, wealth.

Whether, not having coal or iron, which are said to be the sources of our material wealth, we have anything which some may reckon as still more valuable to a nation—intellectual fertility. If the members of this institution are representative of the intellectual condition of Plymouth; and if Plymouth, as she undoubtedly is, is the Queen of the western cities, a great responsibility rests upon us; and this institution requires at our hands all the care, all the attention, and all the energy, that each and all of us can bestow, in order that it may maintain its position as a school of learning. Referring again to my first analogy, We are called upon to hold our own in the struggle for life. And having, I presume, as an institution, in common with all Nature, an intuitive love of life, we cannot neglect to use every effort of which we are capable to support ourselves in the same energetic state of existence that has enabled us so successfully to resist the assaults of time for the last fifty-eight years.

It would seem, then, that it is essential for us to be fully alive to the phenomena which manifest themselves as the intellectual progress of the world proceeds, and to be careful that in this institution they should be correctly reflected. We have little hope of being in advance of our time: that proud position is reserved for individual thinkers, chiefly in the great centres of intelligence and activity of mind. Our care must be not to lag behind our age, and not to cling to old habits of thought which have been thrown off by the intellectual leaders of the day.

I am not alluding to any particular class of thinkers for which I myself may have a preference. I am not attempting to form any judgment, or to invite you to form any judgment, as to the relative state of progress of any school of thought compared with others. The progress of the human mind, at least in the civilized world, is universal. The same mental phenomena may, and doubtless do, characterize the tone of thought in all the different walks of progressive intellect. In order that this institution may maintain its position in its sphere of utility, I invite you to observe the nature of the growth of opinion from time to time, to remark the steps which the march of intellect takes, and the direction in which it moves. The same character may be expected to pervade the development of ideas in all the numerous divisions into which our inquiries are classified. We have among our members those who devote themselves to the study of the various branches of know-

ledge, and it is for them, each and all, to keep themselves on a level with the leading line of thought in the departments to which they have attached themselves.

There are some characteristics of the present age which are more capable of general application than others. Some that are capable of universal application, wherever there is any interchange of ideas by means of a language known to the civilized world

The primary divisions into which the subjects for whose sake this institution was established may be classified, are philosophy, science, art, and literature. Can we, as an institution, recognize any leading characteristic in the present advancing condition of thought in these departments of mental activity which is common to them all? I think a student of the history of any particular era can discover a leading characteristic by which that era may be distinguished. Perhaps it is easier for the historian to perceive the genius which governed mankind at a particular age, having before him the events which succeeded, as well as the records of the conditions which preceded, the period that forms the subject of his researches, than it is for those who themselves play a part in the drama to detect the deep-seated impulse which directs their actions. The historian has not only the advantage of being removed from the influences in operation at the time that he describes, but he has also the opportunity of considering the effect as well as the cause; he can observe not the facts only, but their consequences, without which no fact can be fully understood or appreciated. But though the past may be a study which is easier than the present—though historians may have advantages over those who are students of the phenomena of their own time, they have also conspicuous disadvantages. In point of interest to ourselves the present must be all-absorbing. We are creatures of the present, and the present is also our creation. The interest felt in history itself is mainly due to the light which it throws on the present, to the explanation which it affords of the succession of consequences, all culminating in the events which we now experience, all subordinate to our own state of existence, with our hopes and our fears, our expectations and our speculations, our certainties and our doubts.

An eminent historian has recently, in an address delivered on an occasion similar to this, when the kindred Devonshire Association held its Meeting at Devonport, hazarded an opinion that Shakespeare is your only true historian. It is not for me to question

the views of so great an authority as Mr. Froude on his own special study. But as I have referred to history with the desire to compare the task of the historian with the task of computing the nature of the forces which now shape the course of the human mind, I take the opportunity to consider in what direction the historian himself is carried by the prevailing winds of thought, what are the currents that set towards certain quarters in his particular groove. If Mr. Froude considers such an imaginative genius as Shakespeare to be our best historian, we may perhaps draw some inferences as to the prevailing characteristics of thought in the year 1870, from the specimen which we find in the mind of Mr. Froude.

I have used the word *doubt*. I know to many minds this word has a very alarming significance. It carries havoc with it among some of our most cherished ideas, opinions, beliefs, and hopes. But I am also aware that there are literally no playthings so dangerous as words, that no edged tools can surpass words in the wounds that they inflict when unskilfully handled; and as President of your Institution I have no right to use such instruments wantonly and recklessly, in a manner that could by the remotest chance spread terror among the timid, put the fearless on their guard, or gratify the tastes of the reckless and inconsiderate.

I will not say with Tennyson—

> "There is more good faith in honest doubt,
> Believe me, than in half the creeds."

But I prefer another beautiful quotation from his pen—

> "Leave thou thy sister when she prays,
> Her early heaven, her happy views;
> Nor thou with shadowed hint confuse
> A life that leads melodious days."

I wish therefore to employ this portentous word, as a dangerous implement ought only to be employed. I wish to put it to its proper use, to serve the purpose for which it is required, and to confine its effect strictly to the question which we wish to consider. I will use it, as Mr. Hearder uses his electric battery, the Fulgurator, though it is probably ten times as explosive; and, like him, attempt experiments with a flash of lightning, in a position of safety.

Mr. Froude, then, considers Shakespeare to be our best historian. A dramatist, a poet, and a man of high imaginative genius, who has written historical plays from which very little indeed, a mere atom, can be extracted that affords us any information whatever as to the constitution of our country, the habits of our people, or the government imposed upon us by our kings. I think we shall find that Mr. Froude himself furnishes us with a very good indication of the direction in which the current of thought is now setting. He is a writer of laborious research. He has mastered the languages of many countries in all their detail, for the purpose of exploring their state papers, their collections of letters, and their long-hidden documents. And he has spent much of his life in their capital cities, absorbed in tracing the threads of our history through such labyrinths as these. Is the result of all this painstaking industry a verdict in favour of imagination as the best qualification for an historian? That is not Mr. Froude's meaning. The word *doubt* at once expresses the impression left on his mind as the final result of his labours, and also, I venture to say, points out a presiding impulse which guides the intellectual movements of men at the present day.

If doubt may be set down as one of the intellectual characteristics of the present age, concerning which we wish to inquire, it will be well to consider what is the nature of doubt, and how it operates on the mind. Philosophers will say that it is the most hopeful condition in which the intellect can be placed. It acts as the impulsive force to all inquiry; it implies a state of mind urged to activity by the hope of solving a difficulty; and far from being a negative quality, in which sense it is usually understood, it is the positive incentive that induces us to endeavour to escape from uncertainty, and to discover a state of repose in certainty.

Picture to yourself a man who doubts nothing; a man who would have no doubts with respect to anything that he might hear, see, or feel. Into what an inextricable state of confusion his mind would soon fall! If no man had ever doubted the evidence of his senses, which would lead him to believe that the sun moves round the earth, we never should have discovered that the earth moves round the sun.

Doubt is of course no new quality. It is no new phase of thought now exhibiting itself for the first time. But regarding it, not as a negative condition of mind, but as a positive source of

energetic action; not as a passive principle, but as an active impulse,—it seems to me that it exercises great influence on the tone of mind now prevailing.

If I am right in attributing Mr. Froude's industrious investigations of historical data to a doubt in his mind of the accuracy of history written previous to his time—that is, previous to the present time; for we are proud to say that Mr. Froude is one of us, one of the contributions from Devonshire to the intellectual wealth of the day—it would appear that a state of doubt leads to a minute examination of detail. And I ask you, Is it not a prominent characteristic of the intellectual condition now evident to direct strict researches into the most minute details?

That principle may be observed to be at work in all the four divisions into which the subjects of our inquiries may be classified —in philosophy, in science, in art, and in literature.

In philosophy the analysis of the human mind, and analysis is only another name for the examination of detail, is now carried further and further with a view to detect the slightest clue to a fact in that most interesting, most important, and most difficult of all studies.

In science we may observe it in the employment of microscopes of ever-increasing power; in the molecular theories in chemistry and biology, exhibiting the objective world to us as a congregation of atoms; and in the brilliant results obtained by the spectrum analysis of the rays of light. The addresses recently delivered at the meeting of the British Association by Professor Huxley and Professor Tyndal eloquently affirm it.

It may be observed in art. The arts quickly reflect the discoveries made in the corresponding sciences. They are the practical results of science, the application of science to our use; and every specimen of art, whether a watch or a ship of war, gives evidence of the increasing importance attached to detail. In the fine arts every painter affords us an example of careful attention to detail in his work. The prevailing influence may have carried the Pre-Raphaëlite School into excesses; but there is not a modern picture of merit that has not painstaking study of detail stamped upon every square inch of the canvas.

To trace the same guiding spirit in literature requires a field of extended observation, embracing not only philosophy, science, and art, but also all other subjects which form matter of meditation for

the human mind, fiction being not the least important and remarkable among them. It may be seen, I think, in the advance of the science of philology, and the increasing importance attached to that study. New words are now coined by wholesale, and old words are traced home to their derivation in a parent language, or, further, to a language which may be said to stand in the relationship of a grandmother or great grandmother tongue. The sciences threaten us with a new babel of tongues. It seems absolutely necessary for purposes of minute scientific inquiry, on the same principle of attention to detail, that each science should be furnished with a language of its own. If a student of history or of law were to take up a modern work on chemistry, he would find it utterly unintelligible, the tongue of a foreign nation, to him. Slang words and technical words are imported into polite conversation, and appear in the pages of some of our great writers. In short, it is palpable that if the bent of our minds is towards detail, if the direction of our thoughts indicates a closer and closer analysis of ideas, language, which is the vehicle of thought, must follow, carrying with it the whole paraphernalia of literature. Fiction must echo the general tone, or it will fall into disrepute and neglect. A closer analysis of objects and ideas demands a language composed of a greater variety of words, with a more definite power of expression.

If we are led to the conclusion that *doubt* is a prevailing characteristic of the march of intellect at the present time, and that a state of doubt leads to minute inquiry into detail, we must carry the subject further, and not satisfied with a state of doubt as the condition of the human mind, which is, as I have observed, a negative quality, seek the positive quality which gives rise to doubt in the first place, find the active principle which now seems to lead the human understanding into a state of doubt. And here, I hope, we may light on a characteristic of the intellectual condition of the day which is far more general, far more satisfactory, and far more important, than a mere state of doubt. An intellectual condition of which doubt is only the sign, of which doubt is a mere indication, to which doubt occupies a position of complete subordination. This is the intellectual condition of the present day, which, I believe, is prominent above all others, to which the greatest importance ought to be attached, to which our attention, as members of this Institution, ought to be directed, and in which

I have the most profound faith. It is the desire, the intense, the insatiable desire, for truth.

I do not mean to imply that this desire for truth is new, any more than I imply that doubt is new. But I think the advance of intelligence is decidedly in the direction of a greater and a growing demand for proof. As knowledge accumulates, and education progresses, the mind is not content with mere subterfuges for truth. A truth is not accepted unless it can defy doubt, and doubt is the test of truth, as *aqua vitæ* is the test for gold. Where a doubt can harbour, we cannot say that we have arrived at truth; and thus it is that doubt becomes a positive quality, by acting as a spur to the further and further investigation of everything that is capable of becoming a subject for the operations of the human understanding.

That which I have described as an intense, insatiable desire for truth, is certainly nothing new, nor is it peculiar to the present time. But if it assumes a different aspect, if this desire for truth manifests itself in new forms and shapes as the march of intellect advances, it is very important for us, who wish to keep pace with the times, not to be blind to the signs of the times, and to watch with vigilance "the changes that come o'er the spirit of our dreams." The progress of intellect is certainly at an ever-increasing rate. We cannot measure it as we have measured the force of gravitation; we cannot say that its speed increases at a rate equivalent to the inverse square of the distance; but we can clearly perceive that it proceeds faster and still faster with an ever-accumulating impetus, and that as the pace accelerates new signs present themselves to mark the path which the mind has traversed.

What are the signs which present themselves to us now, and how are we, as members of this Institution, to follow the track—to hold our own in the race which is ever becoming faster and faster?

The search after truth is conducted, as we proceed, with greater vigilance, with more minute care, on a more systematic plan of observation, with more freedom, and by an always increasing number of pursuers. It is embarrassed by less bigotry, by fewer prejudices, and by a fast decreasing number of obstacles which form the defences of our old habits of thought. The whole field of intellectual inquiry is more open than ever to the scientific

investigator of detail by analysis and by system, who will classify and arrange our intellectual wealth according to logical rules, who will label our facts as facts, our theories as theories, and gratify our longing for the repose which we seek in certainty, by defining as closely as definition can be carried the limits of certainty, affording us a certainty even in our uncertainty.

It seems to me that the main characteristics of intellectual progress of the present day may be said to consist in a tendency to minute analysis pervading the whole field of thought, and, as an imperative consequence of minute analysis, a systematic classification of results, and a rule of inquiry by method according to strict logic, any deviation from which is a hopeless waste of energy, not countenanced or tolerated by the organised union of modern investigators. There is no royal road for intellect. Genius must serve in the ranks with industry and patience. The days of random speculation, of hasty conclusions, of authoritative declarations, and, I hope, of violent assertion of opinion, are passing away. A truth supported by proof, unassailable by doubt, does not rest on authority, or require the aid of violence. Such agents are only necessary to furnish props for haphazard theories, and impatient conjectures. Truth stands conspicuous in the way of the laborious student who treads the path that has been marked out step by step by the pioneers that have gone before, inspiring him with encouragement and confidence, and exciting him to further exertion.

It seems to me that another prominent feature of the present time is the diffusion of a high rate of intellectual progress among a greater number of qualified intellects, the number being ever on the increase, and the distribution of intellectual eminence extending over a wider and a wider area as it advances.

If not only intellectual progress is advancing with accumulating force, but the number of individual minds who attain a forward rank in the race, is also increasing, it may be well expected that altered characteristics will be developed, and that changes will take place in the mode of proceeding, which it is important to consider.

We have been accustomed to hear of the genuis and the hero. Those high-sounding titles have been employed to indicate great contrasts in the quality of man. They are relative terms used for marking an exalted degree of excellence. Whether a man be a genius or a hero is a question of comparison with other men. So much are we indebted to contrast for those sensations and ideas

most pleasing to us, that we are aware only of a prominent idea or sensation by virtue of its contrast with others. If our sight only afforded us the sensation of scarlet there would be no such thing as colour; the pleasure which variety of colour gives us would be lost. And if we had no idea of vice, we should be insensible to the feeling of admiration which virtue inspires. What then will become of the genius and the hero if so many are pressing forward to the front in the career which intellect is running? Where will be the contrasts which constitute their existence? The glory of the genius and the hero will fade in the light of equality, and if a number of aspirants become qualified for those elevated positions, there will be no genius and no hero.

I believe we are drifting in that direction. These attractive personages will disappear under a system of analysis and detail, and eke on their existence only in a world of romance and imagination. They have shone brilliantly because there has been no diffused light. How much they have been indebted for their glory in the past to painstaking diligence in detail on the part of obscure industry we shall never know, but the time has come when they must give place to patient, sedulous, unswerving labour.

Is there a genius or a hero now alive? Is it likely that any now living will occupy such lofty places as those words imply in the history or the romance yet to be written? I do not know a reputation towering so high above its fellows as to present the needful contrasts. But there are increasing thousands who are steadily treading the path of progress which I have endeavoured faintly to indicate, and carefully sharing amongst themselves by division and subdivision the work which lies before them. The division and subdivision of labour is not only a necessity in the economy of wealth, but it is the inevitable consequence of every operation of the mind, conducted by a process of minute investigation in detail. The number of subjects, as the work proceeds, increases as fast as, or faster than, the number of minds engaged in the service. The work is never overtaken. The more we discover, the more we find there remains to discover. The more we investigate detail, the more detail we find to investigate. The operations of a great number of minds in various directions, divided and subdivided in their work, with one common object, which we will call the discovery of truth, cannot be conducted except by a complete, thorough, systematic organization.

Is this principle of a thorough, systematic organization of every species of work thoroughly appreciated at the present time?

I think it is one of the most important characteristics of modern developement of thought, but I do not think, judging from the work now in hand of men of eminence and men of no eminence, that it is a characteristic which is as yet fully appreciated. But it seems to me that the tendency of thought sets strongly in that direction.

I am speaking of the pursuit of every subject of inquiry that can occupy the human mind, of those which attract our attention as an Institution, and of all others also. No results, it appears to me, can be obtained at all likely to satisfy the mind and allow it to rest contented, undisturbed by doubt, except through a process of systematic inquiry by analysis and detail, advancing from particulars to generals, by the logical methods of induction and deduction.

It is not requisite to limit the range of imagination, speculation, and theory, but those efforts of mind, admirable as they have been and continue to be, must be distinctly recognized as such, and be permitted to have no more and no less than their due hold on the understanding. They have seldom if ever proved to be correct, but they have often led to discoveries of the greatest value, by the suggestions which they have offered.

If the work before us, that appears as we proceed hardly to have been begun, is not conducted in all its departments on a methodical system, to which every mind ought to be trained, it seems to me that infinite waste is the consequence, a waste of power, a waste amounting to an abuse of gifts, a waste of energy, and a waste of life. We have ample evidence that in every sort of competition it is hopeless for disorganization to contend against organization, or for inferior organization to succeed in a struggle with superior organization. Our experience confirms the power of this marshalling of detail in order and regularity wherever we have felt its force, and teaches us plainly that it must form the basis of intellectual progress.

The philosophy of Auguste Comte, the positive philosopher, now engaging so much attention, is remarkable for the complete methodical system which he lays down for the conduct of mental operations, and is an example of the tendency of modern thought towards method and order.

Briefly, according to his system of philosophy, the sciences would be arranged on the principle of proceeding from the simple to the complex, in the order of their comparative simplicity and complexity, each being sub-divided on the same principle. He places mathematics first, as the science of relative quantity only; astronomy second, as a science dependent on mathematics for the calculation of quantities, but complicated with the phenomena presented by the heavenly bodies and the force of gravitation; he places physics third, the pursuit of which science requires the aid of both the preceding ones; chemistry fourth, as the next in order of complexity; biology fifth; and lastly, the social science, as the most complicated of all, dependent as it is on all the other sciences together, and so intricate in its nature, that though it must take its rank with the sciences, it is as yet but the shadow of a science, defying inquiry on scientific principles, and abiding its time in a state of confusion and random speculation.

I have alluded to the philosophy of Comte—a philosophy which I would not pretend to explain, or to accept, or to criticize—a philosophy of great pretension, and an attempt, I conceive, to master difficulties lying beyond the grasp of a single human mind in our present state of education, merely to illustrate the tendency which I consider to be now apparent towards a systematic arrangement of all the operations of our intellect with order and regularity, a systematizing (this word is now much in use) that affords us some expectation of an approach to certainty.

Doubt seems to me to be an element in our minds which suggests the reverse of repose, and we feel impelled to seek the repose of mind that we desire in certainty. Alternate states of activity and repose are highly pleasurable to us as they succeed one another in every phase of our life, constituting one of the contrasts which afford us the enjoyment that we experience. We have contrived many devices from time to time for the sake of attaining mental repose, many, I will venture to say, which have proved most delusive; but I think there is an impulse in our minds now to be observed, a characteristic of the intellectual progress of the day, which promises to direct us towards the way out, not of our difficulties, but of those difficulties which agitate and distress us, and to enable us to take some rest in certainty.

If this be so, if the tendency of modern thought is in the direction that I have indicated, if order and system in detail are

the ruling powers, if we must submit to the reign of law, the influence of which the mind of the Duke of Argyle exhibits, if disorganization, or defective organization, invariably succumbs before superior organization, the education of a nation destined to contend in an inevitable struggle for life must be founded on a principle of complete organization. The education of the people, that subject to which the attention of this community is now so worthily, yet so tardily turned, must be conducted on a principle that would be an example of the characteristic of the intellectual progress of the age.

It is impossible to estimate the loss, the reckless waste incurred, if it be true that intellectual progress can be made good only by method, order, and system, and if the mode of education of the people is conspicuous for the absence of method, order, and system.

I have alluded to the probable disappearance of the genius and the hero, not fearing any falling off in the esteem due to merit, but looking forward to such an accession of merit, that those high personages will be lost in the crowd.

> "Not that I love Cæsar less,
> But that I love Rome more."

That such an end may be accomplished, that the work which lies before us may be well performed, that the march of intellect may proceed and carry in its train every good thing that may be comprised in the word civilization, the education of every individual mind must be conducted with method and order, from the first dawn of intelligent life onwards, in accordance with an organized system; a system which would exhibit gradually to every individual mind the whole range of mental vision, and endow it with the faculty of recognizing for itself, as it advances, that portion of the burden of labour which it may be best adapted to bear, that division or sub-division of the work which it is most fitted to perform. The mind of every unit, every detail in the mass which constitutes the national intellect as a whole, must be carefully investigated, placed according to its rank, and *led out*, the original strict meaning of the Latin words from which the word education is derived, into the path which it is constructed to follow.

Can there be a question that the mind, carefully and methodically trained from the earliest period, will succeed in competition

with those that have not been so trained? Is there much chance even now, with an imperfect system, for a genius to succeed in any undertaking for which he has not been specially educated, if he be placed in competition with those who have? And is not the same principle applicable to the mass of intellect, to the sum of national intellectual wealth, reckoned as a whole?

A lesson has been recently read on the continent of Europe to all nations well calculated to advance materially their education on the subject of organization—an experimental lesson of such absorbing interest that it rivets attention, and will be impressed for ever on the memory of mankind. Fortunate it is for those nations who have neglected their education if they are not the subjects of an experiment which exhibits with such fearful distinctness the power of superior education and organization when placed in competition with that which is inferior in those respects.

I have for some time past heard that the Germans are the most educated people in the world. We have proofs that it is so in the power of organization which they have manifested so plainly in the gigantic struggle now raging.

The use of the word education is generally limited to the instruction given to the young; and we hear of finishing schools, and now and then of persons who have finished their education. I think a person who has finished her or his education, would be a most interesting character to meet. I should like to induce such a person to lecture at this institution. He would have a great choice of subjects, and we could promise him an audience that would fill this hall. The discussion after the lecture might not appear to its usual advantage, because there would be nothing for us to criticize. We might ask a few feeble questions, which would be promptly answered to our more than satisfaction; and we might dispute amongst ourselves, with our usual lively courtesy, on points on which we had mutually misunderstood one another. But a lecturer who had finished his education would leave us nothing to discuss; his subject would have been treated in a manner which the newspapers would call exhaustive. We should have no weak points to assail, except those which would be exposed in the discourse of the first person who would be adventurous enough to display his ignorance by asking a question, and we should all make up our minds to send our children to the same finishing school that had turned out such a finished specimen of education.

The title of finishing-school seems to be usually, and of course more properly, adopted for ladies' schools than for any others. The lecturer, therefore, with whom we have indulged our imagination, and to whom I have referred in the masculine gender, will considerably enhance that ideal indulgence by assuming the form of a lady.

This fair creature of our fancy is, however, purely imaginary. There is only one finishing-school for us, and that is our death bed. Our education is our daily, our hourly duty, capable also of affording us our greatest pleasure, during the whole course of our lives, and can never approach a finished state. But the burden of responsibility for our education, heavy as it is, heavy as I have endeavoured to represent it, and I should wish to add to the sense of weight under that burden, must be transferred from others and taken upon ourselves as we pass out of childhood, and we shall be much in fault if we neglect the means that are offered to us for that purpose. There must be few among us, when we reach middle life, who have not to mourn over neglected opportunities, with unavailing regret, in serious sadness.

It is in this light that I desire to present this Institution to your notice, to place it before you, and urge you to represent it to others, as offering opportunities for helping one another in our education, which we ought not to neglect; to invite you to recognize its great value, and to perform my duty as President by exhorting you to advocate its claims as a field for the exercise and development of the mental activity of Plymouth, and to render it all the support that it so richly deserves at your hands.

The particular branches of education to which this Institution is devoted are represented in our museum, our library, our lectures, and our discussions; and if you recognize any truth in the observations that I have made on the characteristics of the intellectual progress of the day, it is essential for its welfare that every part of our Institution should correspond to what I have described as the prevailing tone of thought.

A museum that would adequately serve a scientific purpose would tax the energies of our curator to the utmost.

Our library is in the hands of a curator who answers my description of a painstaking, sedulous worker, who acknowledges order, regularity, and system, as the powers that be, and whose care has arranged on the shelves a scientific library of no little

value, classified and catalogued with scientific precision. It seems to me that, as there is already in this town a library of general literature of considerable pretension, we shall best serve the purpose for which our library was established by making it distinctly a library of philosophy and science, composed of works of prominent merit only, that form a necessary link in the series of a philosophic or scientific study.

Our lectures and discussions are, however, the distinguishing features of this Institution. They are the surest indications of our mental activity, of our intellectual progress, and of the state of education to which we have attained.

Of all the means of education available to us, is not speech the most efficacious—speech in the many various forms which it assumes? If we examine minutely the sum of our acquirements, collected carefully or carelessly, as the case may be, from our infancy upwards, shall we not find that conversation has contributed a vast proportion of our mental resources?

In the pen we have a mighty power. It is the mightiest of the mighty. It is the fountain head of education, whilst speech is the active distributor. Our lectures afford us a means of trying our skill in wielding that potent instrument, whilst our discussions exercise us in the faculty of speech. Speech is the great coadjutor of writing in the diffusion of the light of education.

The art of speech, founded on the science of logic, in all its various shapes, whether in conversation, in discussion, in debate, or in oratory, demands study at our hands as an essential part of our education. Amongst the characteristics of the intellectual progress of the day speech must be recognised as exercising increasing influence. We find our philosophers and great men of science to be masters of eloquence, submitting themselves to the ordeal of public discussion, and courting the analysis of criticism in open debate. The influence of the pen is overpowering; but its power is chiefly felt when it is transferred from the atmosphere of the study, and is transmitted through the agency of speech.

This Institution offers opportunities for acquiring that art, an art which appears to me very difficult to acquire with any degree of proficiency. This is a school in which that study is distinctly fostered, keeping pace in this respect at least with the march of intellect, and it has turned out many able scholars, who are now

our ornaments, constituting our assurance that our mental activity does not flag.

I have said that our neglected opportunities are the themes of our saddest reflections. Impressed with this feeling I intreat you to lend your best energies to sustain the character of this Institution, to give it that aid which it will require at your hands to enable it to maintain its position as the habitation of the intellectual activity of Plymouth, and to insure for it a career in the future which shall be CHARACTERISTIC OF THE INTELLECTUAL PROGRESS OF THE TIMES.

THE FULGURATOR.

A NEW ELECTRICAL APPARATUS FOR PRODUCING ELECTRIC SPARKS OF VERY GREAT LENGTH.

BY J. N. HEARDER, F.C.S.

Read at the Conversazione of the Plymouth Institution at the Anniversary Meeting, held May 2nd, 1870.

ABOUT forty years ago, I contrived and exhibited to the members of the Plymouth Institution an arrangement of Leyden jars by which I was able to convert quantity into intensity, and thereby obtain sparks of greatly increased length. This was effected by charging a number of insulated jars of equal size separately, and then arranging them in consecutive order, so that the nob of one jar should touch the outer coating of the other. The first and last jars exhibited the terminal intensities of the arrangement, the one by its nob, and the other by its outer coating, the free electrical states of which were so exalted that on making a connection between the coating of the last jar and the nob of the first, sparks nearly a foot in length were obtained from four or five jars. As there was a limit to this intensity, when the jars were charged singly and placed in consecutive order on account of the tendency of the free electricty to escape in a brush discharge from the front nob when it attained a certain point, I had recourse to a new arrangement.

The jars and their insulating stands were all placed on turntables which were fixed on a frame, and connected by levers with one common bar, which moved the whole at once.

By this means I was able to place them first in a position which permitted them to be charged all together as a battery. When charged, the connecting conductors were removed, thus leaving each jar as a separate charged element.

By a simple motion of the sliding bar, the whole of the jars were simultaneously brought round into consecutive arrangement, each jar having its nob in contact with the coating of the next. Two insulated balls, one placed at either end of the apparatus, served as terminals to connect the coating of the last with the nob of the first, the circuit being completed across the nobs of a suitable universal discharger previously connected with these terminals. By this means sparks of two feet in length were easily procured from a dozen pint Leyden jars.

There has been of late a growing mania for the production of long electrical sparks among electricians, which received its first impulse when I exhibited the effects of tension of my new arrangement of induction coil, which I exhibited to the Plymouth Institution in 1856, and for which I was subsequently honoured with a silver medal from the Royal Cornwall Polytechnic Institution.

From the secondary coils of these instruments I obtained sparks of from three to five inches in length.

These exalted effects gave an impetus to the subject in all countries. Ritchie, in America, constructed a large apparatus which gave sparks 12 inches in length. Rhumkorf, of Paris, the originator of the intensity coil, whose machines had only hitherto given sparks half an inch in length, greatly improved their construction, and Siemans produced one at the Great Exhibition of 1862 which gave sparks over two feet in length. Lately a gigantic machine has been constructed for the Royal Polytechnic Institution, London, under Professor Pepper's direction, by Mr. Apps. According to calculation this should have given sparks 10 or 12 feet long, but the longest yet obtained have been only 30 inches.

Last year a scientific amateur, to whom I had shewn my intensity arrrangement of Leyden jars, expressed a desire to extend the principle, and requested me to prepare for him a much larger set of apparatus. I accordingly constructed for him the instrument now before the society. It consisted of fifteen (now thirteen) Leyden jars, each two feet high and four and a half inches diameter, coated one foot high; each jar therefore contains a square foot of surface.

These jars are mounted vertically on insulating glass pillars, three feet high, and the charging wires are bent down on the outsides into a position which enables the nob of each jar to come into contact with the coating of its neighbour. All the insulating pillars are fixed in a frame in such a way as to permit them to turn on their vertical axes, and are connected at the foot by levers with a long sliding-bar, which moves them simultaneously, as in the arrangement before described. The only points of difference between the present and former arrangement are in the self-acting contrivances for dis-severing the jars from their battery connection with each other, and from conducting communication with the electrical machine, and in the vertical position of the jars, the former arrangement having had the jars placed horizontally. This vertical arrangement was adopted principally for economy of space, and to accommodate the apparatus to the size of the room in which it was used.

It now measures 12 feet in length by six feet in height. Unfortunately, this only gives a space of about four and a half inches between each jar, and consequently the length of spark obtained from it does not exceed four feet six inches. In attempting to obtain longer sparks, the discharge takes place across the intervals from jar to jar.

There can be but very little doubt, however, that if the jars were placed further apart, sparks of nearly double this length could be obtained. On one occasion, when attempting to get longer sparks, the discharge passed down over the insulators of the discharger, which were each three feet in length, and completed the circuit across from one to the other on the floor beneath the carpet, the entire length being nearly 12 feet; thus showing the power which semi-conducting surfaces possess to help on an electrical discharge over a greater distance than it could leap in free air.

Great caution was also required in manipulating with the apparatus, the operator being obliged to work the sliding bar with a long insulating handle, as some rather unpleasant shocks were received even at a distance of two or three feet.

The power of rarefied air to increase the length of a luminous discharge is beautifully shewn by the arrangement of 63 double-wick spirit lamps placed in a straight line, with their 126 flames touching so as to form a continuous line of flame nine feet in

length. Through this it is seen that a moderate charge passes in a brilliant spark from end to end.

The effects of the discharge from the intensity, as compared with the quantity arrangement in battery connection, are very curious, and open up a wide field for investigation.

None of the quantity effects are lost, but, on the contrary, intensity appears to add to the electromotive force by overcoming the resistance in fine metal conductors, for it is seen that the deflagration of gold leaf and metallic wires is more brilliant and the oxidation more complete with the intensity than the quantity discharge. The results obtained from this apparatus are such as to warrant the conclusion that with a more extensive arrangement of jars, and machines of suitable power to charge them, and, lastly, a room of a size sufficient to keep the walls, roof, and floors beyond striking distance, electrical sparks of 20 or 30 feet in length might be procured, since the high intensity is only developed at the moment when the jars are simultaneously brought into the consecutive or intensity position. The sparks at present obtained are so brilliant and crooked in their path, deviating sometimes more than a foot from the straight line, that they in fact constitute a miniature flash of lightning, for which reason I have been induced to apply to the instrument the term Fulgurator.

PREHISTORIC ANTIQUITIES OF DARTMOOR.

ABSTRACT OF MR. SPENCE BATE'S PAPER.

(Read October 13th, 1870.)

He treated first of the physical characteristics of Devonshire —The Derivation of the name of the County. Then on the physical condition of Dartmoor—Earliest records relating to it, 1236—Derivation of the term (Forest)—Its doubtful wooded state—Its sterile character—Its climate in Summer and in Winter. "The mother of many rivers"—Antient Tin Works—Smelting-houses—The description of supposed Britain by the early geographer Hecatæus—Ancient roads over the Moor—Fitz's well—Hut dwellings—Their form, and style of elevation—Walled enclosures, commonly called Pounds—Sacred circles—as Fernworthy—

The Grey Weathers—On the Dart,—Teign, &c.—Parallellitha as those at Kist Tor, Merrivale Bridge, Black Tor, Trowlsworthy Tor, Chalwich Town, &c. Kist-veans—at Merrivale Bridge, Yealm Head, Kist Tor, Hounter Tor, &c. Tumuli—on Three Barrow Tor, Rippon Tor, &c. Cromlechs—at Drewsteignton—Merrivale Bridge—Corydon Ball, &c. He also drew attention to the importance of an accurate survey of the antiquities of Dartmoor, as many of them were being rapidly destroyed for the purpose of making roads and building hedges. He exhibited beautiful specimens of flint celts, arrow-heads, and flakes that had been found beneath the peat on Dartmoor.

THE LATER STOICS.

ABSTRACT OF REV. C. B. SYMES'S PAPER.

(Read October 20th, 1870.

THE reasons for the choice of the subject may be found in the historic, scientific, and practical interest of Stoicism.

In its origin, Stoicism was related closely to Cynicism, and manifested many of its peculiarities.

There is very little of personal interest in the history of the system, and we may therefore pass on to note the leading features of its philosophy, in which we find three great divisions—Logic, Physics, and Ethics.

In Logic its main peculiarity was the attempt to find a subjective criterion of the truth or falsity which it professed to discover in the intensity of the conviction that the judgment was true.

In Physics the Stoics were materialists, regarding substance and attributes as alike material, maintaining that reason, force, and soul were only subtler kinds of matter; hence all causes, the great Cause Himself, was material. From Materialism they were led on to Pantheism, and thence to Fatalism.

Their Ethics were the most important element in their system: they were chiefly comprised in the two ideas. Virtue and pleasure are wholly distinct and hostile: we must seek that virtue which consists in being in harmony with the soul of the universe. In pursuing that virtue we must indulge no emotions, and our happiness must be rather negative than positive.

Passing on to the Roman stage of Stoicism, the characters and writings of Seneca, Epictetus, and Marcus Aurelius pass under review.

In glancing at the merits of Stoicism, the personal and practical character of the system is worthy of appreciation. It directed a man's thoughts to self-culture rather than to anxious desire for outward circumstances, as the source of joy and dignity. Its intense moral earnestness was of peculiar value in the age in which it flourished.

The faults of Stoicism are numerous.

In the first place its ideal was very faulty—it contemplated the crushing out of one part of our nature, and hence could only present as its ideal an imperfect humanity. But even this imperfect ideal it offered no help to reach: refusing to recognize human weakness and insufficiency, it failed to help men.

The resemblances of the Ethics of Stoicism to those of Christianity were then stated and discussed.

ON THE EXPLORATION OF THE SETTLE CAVES, YORKSHIRE.

ABSTRACT OF MR. W. MORRISON'S PAPER.

(Read on the 27th of October.)

Many of the caves in the limestone district of Craven, in the West Riding, have been from time to time partially examined, with a view to determine whether they have been used as habitations. The one which has hitherto produced the greatest number and variety of remains is the Victoria Cave, situated two miles east of Settle, at an elevation of 1460 feet above the sea level. It was discovered by Mr. Jackson, of Settle, who is at present in charge of the excavation, in 1839, on the anniversary of the Queen's accession, whence its name. In the spring of 1870 a committee was formed for the purpose of carrying out the exploration systematically, Mr. Boyd Dawkins having the general direction of the work, and Mr. Jackson being the superintendent. Work was commenced on March 21st, by driving a gallery into the cave at a point a few yards south of the old entrance, when a small amphi-

theatre of limestone rock facing south led Mr. Dawkins to suspect that a rock-shelter may have existed where the old inhabitants would have cooked their food. The following strata were met with:—1. Two feet of *débris* of limestone rock; 2. A blackish bed, henceforth called the relic-bed, 18 inches thick at the entrance, and thinning off irregularly to nine inches as it was followed into the cave; 3. A layer of *débris* of limestone fragments 7 feet thick; 4. A bed of tenacious red clay. A trial hole sunk in this stratum within the cave passed through 13 feet without finding bottom. The cave, so far as it is at present explored, consists of two principal chambers running north and north-east. There are other smaller chambers, and indications of other chambers entirely filled up to the top, which are now being examined. The lowest stratum of red clay so far has been destitute of any remains at all; but lying on it, and between it and the 7 foot stratum of *débris*, have been found bones of bos longifrons, the horse, red deer, and brown bear. Traces of human habitation are found in three small pieces of flint, one of them flaked by an expert hand; these must have been brought from a distance: a piece of hematite, probably for paint: the head of a bone harpoon of a form unique in Britain, but similar to some found in the Swiss lake dwellings, and to those used in Nootka Sound, there being in addition to the barbs two cuts like barbs in the shank pointing the opposite way to the barbs, probably for the purpose of more securely attaching the head to the wooden shaft. A few human teeth of an adult were also found here. The 7 foot layer of *débris* is quite destitute of remains, and soon runs out, the red clay and relic-bed being found inside the cave in juxtaposition. This latter, the relic-bed, contains bones of the bos longifrons, horse, pig, dog, wolf, fox, badger, water rat, red deer, roe deer, sheep, goat, domestic fowl, and grouse, and a few teeth of a child. There were also found in it a number of coins, some illegible, some however bearing the names of Constantine, Carausius, and Tetricus; numerous fragments of ordinary Romano-British pottery; a few fragments of Samian ware, and of a very coarse pottery, not made on the potter's wheel, like that still used in the Hebrides; a ring and bead of jet; bone and glass beads; fragments of sheet glass; a heavy ring of bronze, forming a bracelet, of an Irish type; bronze finger rings; a number of fibulæ, some of them of common Roman types, others enamelled, and others formed of spirals; these two last being of a

Celtic or Norse type, according to conflicting authorities. Also bone and stone spindle whorls; bone shuttles, plain or ornamented with incised lines and dots; needles and pins of bone and bronze; part of a netting needle; bone fish-hooks; a piece of stag's horn, apparently prepared for a hammer; bone spoons carved in the handle and with an oval hole in the bowl; and iron nails; bone lance-heads; part of the ivory hilt of a Roman sword; two buttons, being discs of pottery, but not bored in the middle, one of these being of Samian ware; frogs—for fastening leather clothes —of bone pierced in the centre at right angles to the axis of the bone, and from some of which an incised pattern of diagonal parallel lines has been nearly worn away, presumably by the friction of an upper garment; a leg bone of an ox polished in the middle but rough at each end, perhaps used for dressing skins by dragging them to and fro over the surface; a block of stone scored with grooves in sharpening tools, and another having on it a rude square figure, apparently for some game. The relic-bed is full of charcoal, and a fire-place of grit-stones was found, and some rounded river pebbles, showing marks of fire, which may have been used as "pot-boilers," others seem to have been meant for hammers, possibly for opening shell-fish and smashing bones to get at the marrow. Some long undressed stone slabs were found arranged like a grave, but no body was inside.

The lecturer suggested that as all the fauna found are yet extant in Europe, the remains did not probably go back beyond 5,000 years. The human remains on the red clay he referred to a temporary occupation by hunters, while the more numerous remains of human habitation in the relic-bed, he referred, in part to the times of confusion at the termination of the Roman occupation of Britain, when the unchecked incursions of the Picts and Scots may have compelled the inhabitants of the low country about Settle—where Roman remains have been found—to take refuge with some of their metal ornaments in the caves so numerous in this part of Yorkshire.

FRANCE AND HER REVOLUTIONS.

ABSTRACT OF MR. J. D. LEWIS'S PAPER.

(Read November 3rd, 1870.)

In the revolutions of France they had a subject of present as well as historic interest. France had changed her government many times within the past eighty years; and Talleyrand stated of a constitution that it was the thirteenth he had sworn to. These changes of government were not detached events, but indications of a chronic state of things. The first revolution, that of 1789, was the key to all that followed. It was said that the bulk of the French people were the most down-trodden in the world. The king was well meaning, but weak. Against this state of things the people rose and rested some portion of liberty. But the kings of Europe, in terror lest the feeling and influence should spread, formed a cordon around the country. Then followed the republic, with a captive king. He coquetted with the enemies of the country, and the law in its equality took his life. Then those of the kings of Europe who had hitherto stood aloof meddled in a matter that was not their own, and the Reign of Terror crushing the enemies of the republic at home, the forces of the country were consolidated, and launched upon the enemies abroad. Thus the revolution destroyed the feudal system in France, and was alike a blessing to France and to the whole of Europe. Such opinions as these would be generally accepted, but he believed they were utterly false. The French peasantry were better off than those of most other countries: many of them were landed proprietors; their parishes were governed by local functionaries, not by the nobility; and on the whole the feudal system was perhaps weaker in France than anywhere else. The first phase of the revolution was legitimate, and the demands then made were granted, for the constitution of 1791 was as free as that of England. That constitution marked the limit to which respectability wished to go. At length the mob got the upper hand, and the Reign of Terror followed; want, caused by the winter of 1788–9, which had ushered in the revolution, had increased within; and the only chance of safety for France from foes without was arming the whole nation. A hungry people with arms in its

hands, without its natural leaders, was master of the situation; but was always the prey of demagogues, and led by the most extreme. In this revolution the mob of Paris, the most lawless in the country, was supreme. In their own day they had seen the same state of things. There was nothing so savagely timorous as a mob, and in this fact they had at once the secret of the Reign of Terror. He denied that the leaders of the Reign of Terror were honest enthusiasts or simple bigots, as was often said. If those terms were applicable to any men of that time it was to the Girondins. The Reign of Terror did nothing to save the country, which had already been saved before it reached its height. In fact it was not aimed against the enemies of the country, but against all decent people. Who were the leaders of those times? Marat, and Danton, and Hebert were generally given up as indefensible. No writer had ever been found to say a word on the part of Carrier or Collet d'Herbois. The most important personages of all were Robespierre and St. Just. In truth they had a side which if not favourable was different to the entire blackness of their associates. They were probably sincere; and their desire was to destroy all who were opposed to them, and then to form a government founded on virtue. The excesses of the Reign of Terror were the work of few hands, the bulk of the population waiting tremblingly to advance their true sentiments. Their opportunity came at the fall of Robespierre. The misfortune of France then and now was the want of any political initiative amongst the middle and intelligent classes. The French required to be led more than any other nation. They were easily administered, but not easily governed. They had no machinery for the expression of public opinion; they grumbled and they plotted, and then they rushed into the street and had a revolution, the mob ruling until, like Sinbad's Old Man of the Sea, it fell off in its own drunkenness. What the revolution really did was so to sicken everybody who had more than his head to lose with the jargon of liberty and equality, and to deliver the nation bound hand and foot to the first Napoleon for nearly a score of years, until he left it far worse than he found it. To the revolution also was traceable the rise of the second empire, and the disasters which had befallen France in the present year. Benefiting no nation it had delayed progress everywhere, and its only advantage was that it presented a model of what it was most desirable to avoid.

OUR FOOD.

ABSTRACT OF MR. GEORGE JACKSON'S PAPER.

(Read 10th October, 1870.)

The lecturer first pointed out the importance of food not only in an individual, but in a national point of view; that the political influence of a nation is as much dependent upon the muscular strength of the people as upon their intelligence and commercial industry, and that this strength is wholly referable to a right use and a proper distribution of food. Savage nations often have plenty of food, but it is ill-regulated and not properly mixed, frequently consisting in large quantities of animal food alone. He then referred to the profuse gluttony of the later Roman Empire, when one dish alone at the table has been known to cost £4000, and contrasted it with the habits of the present day—as they are in many cases, and as they should be. The division of food into heat-producers and tissue-formers—not altogether correct—disproved by the experiments of Fick, Wislicenus, and others. Aliments divided by Dr. Prout into four kinds—aqueous, albuminous, saccharine, and oleaginous: their uses. The objections to using tea as a diluent with meat; its action in hardening the muscular fibres: in this respect coffee is preferable, as it does not contain so much astringent matter. The starchy and saccharine matters, speaking generally, pass through a series of changes, which end in their being oxidized and burnt to support the animal heat. A necessity that fresh vegetables should enter into the diet of all persons, the want of them causing scurvy; this is now prevented in sea-going ships by the enforcement of the law causing them to be provisioned with good lime-juice, the goodness being ensured by government examination. The desirability of stricter legislation with regard to adulterations generally. The position tea, coffee, and tobacco, occupy in the animal economy by diminishing the waste of the animal tissues, which is probably connected with their sedative action. Tea and coffee aid activity of thought by lessening the cerebral congestion, which is always associated with sleep. The different effects of tea and coffee—the former acting

more on the mind, the latter on the body generally. The necessity of common salt and lime. Baron Liebig's suggestion for making dough with lime-water, as corn-flour is not a perfectly alimentary substance. The want of lime the cause of many of the complaints of childhood. Milk the only food required for early childhood; the frequent neglect of it, and the substitution of corn-flour and the like. The relative economic values of food—Indian corn, peas, bread, butter-milk, and skimmed milk, said by Dr. E. Smith to form the cheapest food. He then referred to the dietaries of the Prussian, French, and English soldier at various times; the necessity of nitrogenous food when the work done is heavy. The English navvies who, when making the Balaclava Railway astonished both the English and French soldiers by the extraordinary work they did, consumed daily 150 to 159 grammes of albuminate ($453\frac{1}{2}$ grammes = 1 lb). Meat, according to Baron Liebig, contains the albuminates, which are the flesh-producers in the most soluble form. Starch requires the longest time for digestion of the heat-producers. Sugar and dextrine are both much more soluble in water; hence bread, in which the starch undergoes a change into dextrine, or some such allied body, is more digestible than when in the state of flour. Fat is more slowly received into the circulation, but its effects are more lasting. Beverages abounding in alcohol produce warmth in the quickest manner, but probably the effect is more evanescent than in any other way. Nutritive salts are of great importance, yet frequently lost sight of and wasted in cooking and salting meat. The use of Warren's cooking apparatus, in which the meat is cooked in its own juices, and those juices preserved, obviates a great deal of this waste. Food wasted in two ways: in cooking—by boiling too much, frequently—and thus coagulating all the albumen and rendering the meat tough and indigestible. Again, by not using much food that is produced naturally, as mushrooms. There are many sorts which are perfectly edible besides the well-known *Agaricus campestris*. The *Marasmias oreades* is especially mentioned by the Rev. M. J. Berkeley. The *Agaricus nebularis*, or clouded mushroom, is also very succulent. The digestibility of food as tested by the experiments of Dr. Beaumont on Alexis St. Martin. Different methods of preserving meat, generally dependent on the exclusion of air. Prof. Gamgee's method unfortunately a failure for the present. The great use of Liebig's extract of meat in sickness, and after

accidents especially. The composition of most patent foods, as Revalenta Arabica, principally of some form of starch. The adulteration of food—of butter by Thames mud, beef suet, &c.; of milk by water, sheep's brains, chalk, &c.; of tea, the composition of Malo's mixture, Lie tea, its principal adulterations. The use of the microscope in the detection of them. Bread is frequently adulterated, chiefly with rice and potatoes to cause it to absorb more water as well as an intrinsic adulteration. Alum is found in most specimens, used to whiten the bread and cause it to absorb more water.

RAIN.

ABSTRACT OF MR. PENGELLY'S PAPER.

(Read November 17th, 1870.)

THE meteorology of the present year (1870) has been so remarkable as to be calculated to impress every one with the importance of the subject of Rain, and to give every thoughtful person a desire to know something of the machinery by which that essential of life is supplied to us. Rain is largely due to the agency of Electricity and Heat, but on the present occasion it will be dealt with so far only as it is a thermal phenomenon.

There have been various speculations respecting the nature of Heat, but at present it is regarded as a *Mode of Motion*—a motion of the molecules or atoms of bodies. Among its effects on matter the following are prominent:—*Temperature*, *Expansion*, *Liquefaction*, and *Vaporization*. The heat which produces any one of these cannot at the same time do any other work,—cannot produce any one of the others: thus, ice and water at 32° Fahr. have the same *temperature* but not the same amount of *heat*, for the heat required to produce and sustain liquefaction is, were it now so employed, capable of raising the temperature of the same quantity of water from 32° to 172°, that is through 140° Fahr. In like manner, the heat required to convert water at 212° to steam at the same temperature is capable of raising the temperature of the same mass through 990° Fahr. Again, high pressure steam has a higher temperature than that given off by ordinary boiling water, but

the increase of temperature is much less rapid than that of the pressure; hence on escaping into the atmosphere the heat it contains expands it, and its temperature falls correspondingly. Further, solid snow and salt, each at 32°, on being mixed are liquefied by a portion of their own heat, and the temperature accordingly falls considerably below the freezing point of water. Lastly, though in most cases an increase of temperature is accompanied by expansion, water in passing from 32° to 39°·5 actually contracts.

Dr. Black and his followers spoke of the heat which entered a body without raising its temperature as being *Latent*, but as this is to confound temperature with heat, or to suppose the former to be the only effect of which the latter is capable, the term is now used as one of convenience only, and under protest.

Though, all other things being the same, a change of temperature *in the same body* is a trustworthy measure of heat, it fails to be so when different kinds of matter are operated on: thus, the heat which raises a given weight of water 1°, raises that of an equal weight of iron nearly 10°; the *Specific heat* of water exceeding that of iron in that ratio.

Water at all temperatures is capable of giving off vapour (= steam = water + heat), and the temperatures of the two are equal, though they contain very different quantities of heat. As has been stated, steam at 212° has 990° of "latent" heat. Steam at a lower temperature has an increase of ·7° of "latent" heat for each degree of diminished temperature: thus, the "latent" heat of steam at 182°, for example, is $990° + (212 - 182)·7° = 990° + 21° = 1011°$.

That aqueous vapour should ascend through the air is a matter of necessity, since the specific gravity of the former is to that of the latter, the temperature being the same, as 5 : 8. Had it been heavier, however, it would have ascended in accordance with the law of the *Interpenetration of Gases*, which is, as experiments have shown, that aeriform bodies replace one another in volumes which are inversely as the square roots of their densities.

The amount of aqueous vapour which a given space can contain, or which, in technical language, it requires in order to its saturation, is independent of the presence or absence of the atmosphere, and is a direct function of the temperature, as shown in the following table:—

Temperature.	Units of Vapour required for saturation.
40°F.	260
50°	360
60°	520
70°	726
80°	1012
90°	1360

It is obvious that the increase of vapour is at a rate much more rapid than that of the temperature, and, consequently, that two distinct volumes of saturated air at different temperatures, on being commingled, become supersaturated; thus, a cubic foot at 40° with its 260 units of vapour, and a cubic foot at 60° containing 520 such units, will on being mixed form two cubic feet at 50° = (40 + 60) ÷ 2, each of which will have 390 units of vapour = (260 + 520) ÷ 2, that is 30 units = (390 − 360) more than is requisite for its saturation, and which will therefore be at once condensed into water, and either precipitated or formed into cloud.

Supersaturation, however, may be produced in other ways: first, by the saturated air parting with its heat by radiation; and second, by impinging on a mountain side. In the latter case, the following changes occur in succession :—first, the air ascends—that being the direction of least resistance; second, being by its ascent partially released from the superincumbent pressure, a portion of the heat within it causes it to expand; third, a portion of the heat by which its temperature was sustained being thus withdrawn for other service, it becomes cooler; and fourth, by its loss of temperature its capacity for vapour is diminished, it becomes supersaturated, and a cloud is formed. Mountains therefore *form* clouds, but do not *attract* them, as is commonly supposed.

Clouds, which may be defined as an aggregation of particles of *water* floating in a sea of aqueous vapour and air, though composed of transparent matter and floating in a transparent medium, are more or less opaque; for air and water having different degrees of refractiveness, the rays of light in passing through a cloud lose a large amount of light by reflexion from the numerous successive surfaces of air and water which they alternately encounter.

Though consisting of comparatively heavy matter, each particle of a cloud is so minute that its weight does not exceed that of an equal volume of air by an amount sufficient to overcome the atmospheric resistance, and hence it floats. By coalescing, however,

the weight increases more rapidly than the resistance, and ultimately precipitation follows:—thus, if eight spherical particles unite, they form a spherical drop whose weight is increased eight times, whilst its surface, on which alone the resistance depends, is increased four times only; hence the resistance in relation to the weight is only one-half of what it was; if twenty-seven particles coalesce the relative resistance is diminished to one third; and so on, the relative resistance being inversely as the cube root of the weight.

Clouds, however, may, *as such*, retain their places and heights unchanged for lengthened periods, whilst the matter composing them is ceaselessly descending: thus, every one has frequently seen a cloud apparently stationary on a mountain top, and sharply cut off at some distance below it. An approach to it, however, dispels this appearance, and at once shows, except in perfectly calm weather, that the cloud-matter is constantly descending on the leeward side of the hill, where, on reaching a well-defined line, it is re-melted into invisible vapour, to have its place supplied by matter constantly arriving from the windward side, where the reverse, or condensing process, is in full operation.

It is obvious that the rainfall and number of wet days on high ground will exceed those at lower levels; that winds from the ocean and from warm directions will be wetter than from continental and cold quarters; that in Western Europe, the wet winds are those from the south and west; and that lands on that side of lofty eminences will be wetter than those on the opposite side. As a matter of fact, it is found that if lines be drawn from the northern and southern points of Dartmoor in a north-east direction, all places in Devonshire between those lines and on the east of Dartmoor will be drier than those places in the county which are not thus situated.

It is obvious too that in wet weather, when the whole atmosphere is supersaturated from the upper cloud region to the ground, gauges *above* the ground will receive less rain than those that are *on* it, since the latter receive *all* the rain that falls, but the latter only a *part* of it; and thus the defect will be an inverse function of the height of the gauge. Some of the rainfall returns published annually by Mr. Symons are not only useless but absolutely mischievous, from being obtained from gauges placed, as at Plymouth and some other places, at great heights above the ground, and in crowded streets—stations unsuitable on several accounts.

That the Moon has some, though probably a small, influence on the weather is by no means improbable. Many of her alleged pluvial connexions however,—such, for example, as that when she is seen on her back she betokens wet weather—are simply absurd.

The following table shews the result of daily observations made at Torquay during 74 complete *Lunations*, from the new moon on January 9th, 1864, to January 1st, 1870,—a period of 2185 days. The "first quarter," in each case, begins on the day of New Moon and ends with the day before that on which she becomes a semi-circle; and so on for the other quarters:—

	Quarters.				Totals.
	1st.	2nd.	3rd.	4th.	
Rainfall in inches.....	56·66	58·87	57·30	55·90	228·73
No. of Wet days	274	248	307	274	1103
No of Dry days	274	301	241	266	1082
Wet-day rate of rain in inches.....	·20	·24	·19	·20	·21

It may be doubted whether, at present, we have sufficient data for the solution of this problem.

As the precipitation and evaporation of the entire world must in the long run be equal to one another, and as the water carried to the ocean by rivers in the northern hemisphere exceeds that similarly transported in the south in a much higher ratio than the land north of the equator exceeds that south of it, it follows that, on the whole, the northern is a hemisphere of *excessive precipitation*, whilst the southern is characterized by *excessive evaporation*. In short, the southern ocean is our well, whence heat draws water for us in the form of vapour; and the clouds are the water vessels, which the winds—the water carriers—transport to us. But in sending us its water, the south sends with it much of its heat also; and this, amongst other agencies, causes the well-known comparatively low mean temperature of the southern hemisphere, notwithstanding the fact that it has its summer when the earth is in perihelion.

INSTINCT AND REASON.

ABSTRACT OF DR. C. A. HINGSTON'S PAPER.

(Read November 24th, 1870.)

THE lecturer commenced by showing the great obstacles which the love of the marvellous placed in the way of ascertaining the truth of the many stories with regard to the instincts of animals. He described the instincts of Ants, as exhibited in the construction of their dwellings, and in the capture and possession of slaves. The cell-making instincts of Bees, and the peculiar instinct of the Cuckoo in laying her eggs in the nests of other birds, were also discussed. A comparison of these instinctive actions showed that in the first place no experience or education was required for their performance, the first attempt of the new-born animal being as perfect and complete as that of any of its forefathers; secondly, that the same species of animal always perform instinctive actions nearly if not exactly in the same manner in every quarter of the globe, and no improvement or alteration takes place from one generation to another; thirdly, that instinctive actions are still performed, even if the circumstances requiring them are completely altered. A beaver will still build a dam, even if its confinement in a pond renders the dyke of no service.

The character of the nervous system was then considered, in order to ascertain that form of it which was most conducive to the exhibition of instinct. It appeared that without the presence of a nervous system instinct was unable to manifest itself, and that those animals, such as insects, which possessed the most highly-developed nervous system, without true brains, were almost solely governed by instinct.

Pari passu with the developments of the true brain instinct releases its hold, until, on ascending to man, we find its manifestations so obscured that its presence becomes almost doubtful.

The views that are held by some metaphysicians, that instincts are merely acquired habits hereditarily transmitted, were then discussed and illustrated; and it was determined, that acquired habits so transmitted were in every case variations of instinct. Just as

varieties in plants have a tendency to return to their original species, so it was shown that the acquired habits had a tendency to return to the instincts common to their class.

The characteristics of intelligent actions as compared with instinctive were shown—1st, in the variety of means exercised to attain the same end, not only by different animals at the same time, but by successive generations; 2nd, in their power of being modified by education; 3rd, in their power of adapting themselves to circumstences.

An anatomical review showed that the amount of intelligence bore an exact relationship to the quantity and arrangement of the true brain, only the first elements of which were found amongst the highest invertebrata.

Intelligence was found to differ in animals and in man. In the former, all the evidences of intelligence linked themselves to one of the special senses which was usually acutely developed; and it was owing to the law of association of ideas that their wonderful manifestations of reason were dependent. In the case of domestic animals, such as horses and dogs, we find that their constant contact with man has enabled them to reflect a little of his reason.

In man alone is a power of self-consciousness, and a power of dealing with matters above sense; and to this form of intelligence the term reason is properly limited. A comparison of instinctive action with those performed by man, rendered it evident that the former manifested far more unhesitating wisdom than the latter; and the lecture was concluded by a discussion of the question whether the brain in individualizing reason increased or diminished its manifestations.

To the Editor of the Journal of the Plymouth Institution.

Sir,—Dr. Hingston closed the discussion on his paper on "Instinct and Reason" by stating that no instance of reasoning had been recorded in animals below the vertebrata; that is, in animals where a true brain does not exist.

The following has been published:—I think it was in Falmouth harbour that a fisherman observed a lobster, in the clear water beneath his boat, several times approach an oyster, and endeavoured to insert his claws within its shell. At each attempt

the oyster as knowingly closed, and kept out the intruder. The lobster waited until the oyster again opened; he then threw a pebble between the valves, and so prevented the shells from closing. The oyster now readily fell a prey to its hungry enemy.

I remember, when pursuing some researches into the boring of marine animals into shells, &c., observing a dog-whelk (*Purpura lapilla*) attach itself to and commenced drilling the shell of a mussel. I removed the whelk two or three times that I might see how the operation progressed. On each occasion the whelk invariably returned to the same spot and recommenced boring. I cut the muscles of the mussel so that I might be able to observe the way in which it would be devoured through the hole that was being made. No sooner had I done this than the whelk left its old position, and creeping round inserted its proboscis between the valves of its now powerless victim, and so ate it.

I could give several instances in which animals low in the scale of zoological life exhibit evidence of exercising judgment, instead of following out the blind instinct of their race.

SPENCE BATE.

PRUSSIA IN 1866.

ABSTRACT OF REV. F. E. ANTHONY'S PAPER.

(Read December 1st, 1870.)

THE traditional policy of Prussia has always included—

1. The maintenance of an efficient military system.
2. Jealous rivalry of Austria.

Both these principles have arisen from the instinct of self-preservation, through Prussia's position in Europe.

Frederic William, the Great Elector, initiated this policy. His successors continued it. Frederic the Great won a place for himself and his army in the first rank of military renown. A new system of tactics introduced with the French Revolution. Napoleon's invasion of Prussia—her defeat and humiliation. During the French occupation the present military system was organised, and on the expulsion of the French was applied to the whole nation. It is based on the principle that "in a lawfully administered armament of the nation lies the best security of lasting peace." This

armament included the enrolment of almost every man in the country from 20 to 50 years of age. They were distributed in the standing army—Landwehr of the first call, Landwehr of the second call, or the Landsturm.

The original plan was somewhat modified in subsequent years. The Landwehr was reduced to act as reserves and garrison forces alone, and the standing army increased. This change met with violent opposition in the Chamber of Deputies, and the contest continued until the war with Denmark in 1863. This, followed by the defeat of Austria in 1866, seems to have reconciled all parties to the change, which is now carried out in all its details without opposition.

The "Danish difficulty," as the occasion for the war between Austria and Prussia, cannot be passed by.

Denmark joined the Germanic Confederation in 1815, in right of Holstein and Lauenburg, and to this must be traced the dispute with Germany about the Elbe Duchies.

The want of a naval force, long desired by the Germans, led them to watch jealously any attempt to unite Holstein more closely to Denmark. The revolution in 1848 gave an opportunity for the "national party" to interfere. Prussian troops occupied the Duchies, and peace was restored only on condition that Denmark should invoke the German Diet for the pacification of Holstein. This gave the German party a hold which they never relinquished.

At length the Treaty of London settled the Danish succession, and Austria and Prussia assented to this treaty with the understanding that Slesvig was not to be incorporated with Denmark in the government of the country. This condition led to difficulty in determining the government of the Duchies. Every proposal of the King was objected to until in 1863 he issued a proclamation separating Holstein and Slesvig. This aroused a strong feeling in Germany as leading to a breach of the condition agreed to. The Diet threatened Federal execution, and at this juncture the king died. This led to further complications. The Federal execution took place, war broke out, and Denmark was overpowered. By the Treaty of Vienna (October 30th, 1864) the Danish king gave up all rights in the three Duchies of Slesvig, Holstein, and Lauenburg. Austria and Prussia intrigued, and succeeded in getting the entire administration of the ceded territory in their hands. They soon quarrelled. The first point of difference was on the succession

to the Duchies, then in their joint management. A temporary agreement was brought about by the Treaty of Gastein, in August 20th, 1865, by which Austria took Holstein, Prussia took Slesvig, and Lauenburg was given up to the latter on payment of 2,500,000 dollars to Austria. This treaty excited much feeling in Europe and Germany. Count Bismarck, in anticipation of future difficulties, secured Napoleon's neutrality. The relations between Austria and Prussia became more strained, until an open breach between the two powers became inevitable. Both governments call counsels of war. Austria decides to make some preparations; Prussia charges Austria with this, and issues a decree to mobilise the army.

Alliance offensive and defensive is concluded between Prussia and Italy on April 7th, 1866.

Notes are exchanged between Austria and Prussia on the subject of mutual disarmament. Both agree to this, but Austria pleads the condition of Italy as a reason for maintaining the army of Italy on a war footing.

Prussia refuses to acknowledge the necessity for this; the other great Powers try to interfere and fail. The Diet is convoked, and Federal execution decreed against Prussia. Prussia declares that by this act the constitution of the Confederation has been violated, and it is therefore dissolved. War. Resources of the belligerents. The success of the Prussian arms is followed by the Treaty of Nicolsburg, signed July 30th.

Austria is excluded from the German Confederation and loses Venetia. Prussia annexes Hanover, Hesse Cassel, Nassau, and Frankfort. The North German Confederation is formed, with Prussia at its head; a secret treaty is made between Prussia and the Southern States; henceforward Germany is Prussia.

In conclusion, the question is discussed, How far the fall of the Germanic Confederation is to be regarded as a misfortune to Germany? Answered in the negative.

OUR EYES.

ABSTRACT OF MR. W. SQUARE'S PAPER.

(Read December 8th, 1870.)

THE lecturer said that the eyes might be treated as most of the other organs of the body, and described anatomically and physiologically. He touched briefly upon the external structures—the lids, eyelashes, tears, and conjunctiva—and then went on to the description of each of the various structures of the eye itself.

The sclerotic is the tough fibrous coat forming the great bulk of the external surface; in front it alters its structure and is known as the cornea. Inside the sclerotic is the choroid—a coat composed of blood-vessels and pigment cells—at the junction of the cornea and sclerotic, and immediately behind it is placed the ciliary muscle, the part concerned in the accommodation of the eye.

The iris is a moveable curtain suspended in the aqueous humour, and has a central aperture—the pupil. This is capable of contraction and dilatation. The humours are three in number: the aqueous, vitreous, and the lens. The lens is biconvex, and is altered in accommodation by the action of the ciliary muscle. It is composed of pectinated fibres; it is contained in a capsule. The retina is the most complex of all the internal structures of the eye. It consists of eight layers.

The lecturer described the intimate relation between its various parts, and especially dwelt upon the fibres of Müller, the bacillary layer, and its rods and bulbs.

The optic disc and the yellow spot were next described, and the optic nerves and optic tracts, the optic commissure, and the general anatomical connexion of the eyes and the brain.

The anatomical division of the lecture was concluded by a description of the appearances seen in the eye during life by the aid of the ophthalmoscope.

The physiological part of the lecture commenced by a brief description of the uses of the external parts. For optical purposes rays of light must be supposed to come from every object that the eye becomes cognizant of. The behaviour of rays of light during

their passage through media of different density were treated of, and refraction as it takes place in the human eye. The various hindrances to perfect refraction were enumerated—chromatic and spherical aberration, and how they were corrected. There are, however, other causes that may cause imperfection of refraction, such as myopia, hypermetropia, presbyopia, and astigmatism. These were each described; the troubles of hypermetropia and the great danger of short-sightedness were also mentioned. In order that objects should be perfectly seen that are placed at varying distances from the eyes, it is necessary that some integral change should take place in the organs themselves. This change is known as accommodation. Its performance was described and shewn to reside in the lens. The image of external objects being supposed to impinge on the retina perfectly refracted, the lecturer went on to demonstrate that the percipient element in the retina was the cones in the bacillary layer, and quoted instances of various analogues in the nerves of the other special senses. He also shewed in how great a measure vision was dependent upon the sense of touch for the perfection of ideas of external objects. He described the inversion of the image on the retina, but also shewed it was not necessarily so transferred to the brain. He regarded the reception of ideas from without as placing the brain in a state of consciousness to receive such ideas, but that they were not immediately transferred as such from the retina.

Stereoscopic vision was treated of, and various other subjective phenomena, such as the ideas of size and distance, the retention of retinal impressions, complimentary colours, diffusion of retinal impressions, &c., and in conclusion he shewed that the difficulty of understanding vision lay in the space between the eyes and the brain.

ART IN THE REIGN OF QUEEN ANNE, AND THE POST-REFORMATION ART IN ENGLAND PRECEDING IT.

ABSTRACT OF MR. J. HINE'S PAPER.

(Read December 15th, 1870.)

INTRODUCTORY remarks, in which conflicting feelings on the subject were expressed. Qualified praise bestowed on the Art of the period. The revolution in Art effected by Inigo Jones and Wren. The superseded Goth blessing his enemies. A brief sketch of the history of the Post-Reformation Art in England. Art taken out of the hands of the church, and the influence of the revival of classical learning. Holbein, Oliver, and the other early portrait painters. Their works criticised and contrasted with those of Lely and the later painters. The transitional period of Art in Elizabeth's reign described, and the partial revival of Gothic in James I.'s reign. Art greatly encouraged by Charles I. in his employment of Reubens and Vandyke. The practice of foreign artists in England. Native architects. The adoption of pure classic form by Inigo Jones. The abandonment of Art during the Commonwealth; Cromwell's contempt for it, however, balanced by Milton's appreciation of it. The painters of Charles II.'s reign, and the reigns succeeding. Concluding with a review of some of the works of Wren, Vanbrugh, and Gibbons.

MISTLETOE ON THE OAK.

(*Viscum album, L.*)

PERHAPS no fact connected with those ancient priests of our country, the Druids, is more generally known than their veneration for the Mistletoe (*Viscum album, L.*) when found on the oak; but whether their regard for it was confined to those bushes that were nurtured by this tree, or extended in a less degree to it wherever located, is not, I think, quite clear. If *Viscum album* were as rare on the oak in their day as it is in our own, one would imagine that

it must have been extremely difficult for them to get a sufficient supply of it from the venerated tree for all the ceremonies and incantations in which they employed it. Its great rarity on it now will be apparent when I say that all the instances of its growing there that the writer of an extremely interesting and elaborate article on this curious parasite, in the *Journal of Botany* for December, 1864, could find recorded as existing in England, at the time he wrote, were seven only. To these, however, he has since been enabled to add one other, from an oak with mistletoe on it having been discovered last year in a hedge-row of a field called "The Harps," at Haven, in the ancient forest of Deerfold; so there are now altogether eight examples recorded by Dr. Bull, the author of the papers referred to. The other seven are stated to be at the following places:

1. At Eastnor, near Malvern.
2. At Tedstone, Delamere.
3. At Badam's Court, Sedbury Park, near Chepstow.
4. At Burningfold Farm, Dunsfold, Surrey.
5. In Hackwook Park, near Basingstoke.
6. "The Plymouth Oak. On recent authority, that of Mr. Edwin Lees, as quoted by Mr. T. W. Gissing in the new series of the *Phytologist* (vol. i. p. 192), it grows in an oak-tree not far from Plymouth, by the side of the South Devon Railway."
7. The Frampton Seven Oak. (H. C. Clifford.)

I commenced this little paper on purpose to make some remarks on one of these alledged examples of mistletoe-fostering oaks; namely, No. 6, the tree that has the name of our good town attached to it—"the Plymouth Oak." The station is more precisely given in Ravenshaw's *List of Devon Plants*, published in 1860, than in Dr. Bull's paper; for there it appears as "an oak in a wood three miles from Plymouth, by the side of the South Devon Railway," on the authority of Mr. Gissing. Besides being mentioned in the three works already named (*Journal of Botany*, *Phytologist*, and Ravenshaw's *Devon Flora*), this tree has been brought forward as a mistletoe-bearing one in the last number of the *Quarterly Journal of Science*.

After this it seems, I must confess, rather an ungracious work for me, a Plymouth botanist, to dispute the right of my own fair town to the great honour, botanically, of having so remarkable a natural curiosity linked with its name in the works just mentioned,

but inasmuch as I believe that this tree, about which so much has been said, exists in print alone, and as the motto of every naturalist is "truth above all things," I go on to enquire on what foundation rests the assertion of our having the so-called Plymouth oak. It is evidently the one statement of Mr. Edwin Lees, a gentleman of some deserved reputation as a British botanist, copied from one work into another. Having myself failed to find the tree in the locality named, I in 1866, wrote to Mr. Lees on the subject, asking him if he would favour me with further particulars respecting it. He kindly gave me all he could, saying that so far as his memory would then serve him, the locality where he, five years previously saw the mistletoe, was in a grove of oaks near the first station of the South Devon Railway from Plymouth. He did not remember the name of the station, but he perfectly remembered stopping, and close to the station were a number of very tall but not large oaks. Mr. Lees added, "when out on a ramble I generally peer among trees, and in my *Botanical Looker Out*, have mentioned all the different trees on which I have seen *Viscum album* growing. I was therefore incited to look closely into these oaks which struck me as remarkable, being so thin and tall, and among the topmost branches of one of them a bush of mistletoe was clearly discernible, and to be quite certain I gazed upon it again and again. It was not a large bush, and appeared old and partly denuded of leaves. Possibly it may have since died away, for it had a scraggy aspect, though its branches would remain for some time even if dead. I must remark that it was very high up in the tree, and would require a sharp eye to distinguish it. The tall grove of oaks," continued Mr. Lees, "must remain no doubt; and among the trees of that grove it may be worth while carefully to look, but high up among the topmost branches."

This is the evidence I possess respecting "The Plymouth Oak," and its mistletoe, and I think most who read it will come to the same conclusion as I have, viz., that Mr. Lees was mistaken, and that what he regarded as the parasite was perhaps a small mass of withering ivy, the sickly green remnant of an otherwise leafless bush, or else some abnormal development of a branch of the oak itself, akin to the "witch-knots" sometimes seen on the birch and the silver fir. What makes this all the more probable is the fact of its being so unlikely that we should have mistletoe on the oak in this neighbourhood, where I believe it is never found in a wild

state even on the trees it most affects in other districts, such as the apple, hawthorn, some poplars, &c. It exists I know about Plymouth in some gardens and pleasure grounds *where it has been introduced*, but I have never met with a reliable account of its growing spontaneously anywhere in West Devon or Cornwall.

Should however anyone who may read this succeed in finding the Plymouth oak with its mistletoe, and consequently prove that Mr. Lees was right and that I am wrong, I feel certain the members of the Plymouth Institution would gladly see every particular he could supply respecting the botanical curiosity inserted in the "Transactions" of their Society.

T. R. Archer Briggs.

4, Portland Villas, Plymouth,
October 13th, 1870.

To the Editor of the Journal of the Plymouth Institution.

Sir,—In the remarks on the Boar Fish in *Land and Water* last week, it was stated that fish were often rare only from our want of knowledge of their habitat.

The same may be said of the Silvery Hairtail,—a fish once so rare that the late J. Couch, Esq., in obtaining specimens for his valuable work, "History of British Fishes," could only get two broken parts, which had been cast on our shores in storms, in order to get a whole figure. This fish is now, comparatively speaking, plentiful about six miles off Plymouth. It gets entangled in the towing-nets, and, considering the smallness of the herring-mesh as compared with the head of the Hairtail, competent judges state, that if a net were used capable of enclosing its head, quantities of these silvery creatures could be caught. As it is about twenty specimens have been landed, and I hope to send you one for your museum.

I am, yours truly,

Matthew Dunn.

Mevagissey, Dec. 8th, 1870.

[Mr. Dunn also informs us that he has within this last year taken two specimens of the Electric Ray.]

CONVERSAZIONE.

(Held January 12th, 1871.)

THE Institution conversazione was largely attended by the members of the society and their friends. The walls of the Athenæum were hung, according to custom, with paintings and water-colour drawings. The collection was not so large as in former years, but the quality fully made up whatever was deficient in the quantity. Among the paintings was Dingle's "Cornfield," after Constable. Mr. Dingle also shewed some smaller paintings, and Dingle, jun., had a couple of little pictures—one a scene off the coast, and the other a bit of rural landscape. Mr. F. Lane was represented by three portraits—one of the late Dr. Yonge, a second of the late Dr. Cookworthy, faithful and lifelike presentments of bygone worthies; and a third of Mr. Isaac Latimer. Mr. H. Luscombe had two marine pieces—one of the Cambridge, and the other "Off the Dockyard." Mr. W. Williams sent a cliff scene. Another and younger artist of the same surname—Mr. Harry J. Williams, of Plymouth—shewed a "Winter Sunset at the Lizard." A couple of clever figure compositions were shewn by Miss Cumming, the young "Fisher Girl" and the head of Ophelia. Colonel Cummings contributed a painting of a shipwreck. There were also a couple of large landscapes by Horlor, and a portrait of the late Mr. Prance by Paterson. The chief contributors to the water-colour department were Mr. Philip Mitchell and Mr. W. H. Pike. Mr. Mitchell was never represented to better effect. The two principal drawings shewn by him were "Horndon Woods" and "At Willsworthy." Each landscape is characteristically Devonian, alternating mountain, wood, rock, and river; but the former is the more rugged of the two. "On the Lyd"—the boulders and the waters tumbling over them depicted with wonderful *vraisemblance*—and a complete contrast to the wide-reaching moorland landscapes, "Roborough Down" and "Black Down," by the same artist. Mr. Pike sent a number of drawings of coast scenes on the north coast, notably from Trebarwith. The most important was "Sand Gathering," which displays all that breadth and quiet force of colour and form for which he is remarkable. The "Gull

Rock" is another example of the artist's style, also the "Evening after the Gale, Lizard." Mr. Penson was represented by a couple of out-door sketches only. One is a scene in Bickleigh Vale, near Shaugh Bridge; and the other a sketch of the Dewerstone—as seen under a heavy sky. With Mr. Cole's "Views on the Lynn" a couple of lake scenes by Mr. E. Penley, and some drawings by Mr. W. J. B. Smith, made up the total of the collection. The "Lowlands from the Manacles," and "Goonhilly Downs" should not be passed over. It will be seen from this brief statement that there was plenty to attract the eye and delight the taste on the walls, but a little space unoccupied might have been filled, and we should like on future occasions to see the works of amateurs in greater force. Not that the productions of professional artists should be excluded. They should always have the preference; but while there is room for both, both should be represented, and amateurs should be encouraged to contribute, taking their chance of room being available and of criticism, which is not likely to do them any harm and may prove serviceable. The musical portion of the evening's entertainment was supplied by the Messrs. Weekes and some lady and gentlemen amateurs. Mr. Samuel Weekes commenced the programme by performing, with admirable taste and execution, Beethoven's famous "Moonlight" sonata. Miss Calmady sang "Le Parlate d'Amor," and Werkerlin's Serenade (tirée de Ruy Blas) greatly to the pleasure of her hearers; and Mr. A. P. Prowse gave Callcott's "Last Man" with earnest pathos. The programme also included a reading by the President of Tennyson's "Grandmother." Mendelssohn's trio in D minor was played by Miss Prowse, piano; Mr. T. Weekes, violin; and Mr. S. Weekes, harmonium; and solos on the harmonium and piano by the latter gentleman.

KARL THEODOR KÖRNER, THE SOLDIER-POET OF GERMANY.

ABSTRACT OF MR. E. SPENDER'S PAPER.

(Read January 19th, 1871.)

The subject of the paper was born at Dresden, in 1791. He was a very delicate child, but his parents brought him up wisely, gave him plenty of fresh air, and encouraged him in athletic sports. He became a skilful gymnast, a bold rider, a graceful dancer, an

expert swimmer, and as time went on a formidable swordsman. He was also a most accomplished musician, and it was his delight to wander forth with his guitar in his hand, and accompanying with its strains his own verses. His greatest friend was Schiller, and he had therefore a very wholesome horror of mediocrity. Fearing that his son might become a mere poetaster, the elder Körner attempted to divert Theodor's thoughts to other pursuits than verse-making. He was destined for mining, which has long been a profession in Germany, while in England it has been carried on by the rule of thumb. At the University of Leipzig he got into a scrape. The aristocratic students there refused to give the burgher students the "satisfaction" of gentlemen. The burghers felt this acutely. They could not bear to be deprived of the luxury of having their noses slit by a "Von" or of having their faces laid open by the owner of a dozen quarterings. Körner espoused the burghers' cause, and with their assistance he attacked a party of "tufts" cudgelled them, and put them to flight. They, thinking that their honour would be less tarnished by meeting their opponents than by submitting to another cudgelling, agreed to fight in the orthodox university fashion. Körner was honoured by being selected as the burgher champion. He and his aristocratic adversary first tried pistols with no result, then resorted to swords with such effect that Körner fell bathed in his own blood. On his recovery he had to leave Leipzig, and after a brief stay at Berlin went to Vienna. Here his poetical genius got the mastery of him, and his father, after a friendly caution against too rapid production, allowed him to have his way. His first play was so successful that it obtained for him a post at the Court Theatre. His second piece, "Zriny," the Hungarian Leonidas, so charmed that prince of critics, Goethe, that he had it acted at Weimar, which was about the greatest honour that could then be conferred upon a young poet. About this time Körner became betrothed to a beautiful girl, and thus blessed with love and fame life seemed to be infinitely bright for him. But no true German could be perfectly happy at this time. Prussia especially was still suffering the effects of the disaster of Jena, and the resulting treaty of Tilsit. Then ensued the memorable retreat from Moscow, and as the grand army hurried back through Prussia, with troops worn and wasted and wan, it soon became evident that a great calamity had overtaken Prussia's detested foe. Straightway

the people rose, and insisted that their timid King should declare war against the Emperor. Mr. Spender then went on to describe the great national uprising of 1813, and contrasted the solemn, earnest enthusiasm of that time with the frivolous "light-heartedness" with which France rushed into war last July. Körner was one of the volunteers of 1813. He joined the free corps of Jägers, and soon endeared himself to his comrades both by his valour and his poetical genius. He was bravest of the brave in fight, and in the intervals of combat he wrote those fine songs which were afterwards published under the name of "Lyre and Sword." On one occasion he had a very narrow escape. An armistice had been arranged between France and Germany after the battle of Bautzen, but Napoleon had secretly ordered his troops not to respect the armistice so far as the Jägers were concerned. Körner and his comrades, unaware of this, and having been previously assured that they would not be attacked, went forward to meet a French detachment. He was cut down treacherously, and his comrades were put to flight. Escaping to a wood he lay all the night hearing his enemies seeking him. Thinking that death was at hand he wrote his song, "Farewell to life," and then sank to sleep. He was awakened by some peasants, who conveyed him safely away to a hiding place. After his recovery he rejoined his corps. On August 26th, 1813, early in the morning, he was reading to one of his comrades his famous "Sword Song" which he had just written, when he was summoned to action. He had the satisfaction of putting the enemy to flight, but in pursuing them was shot, and died almost immediately, at the age of 22. His sister died shortly afterwards broken-hearted. A friend, Bärenhorst by name, refused to survive him, and a few days after his death rushed into the midst of the enemy, and crying, "Körner, I follow thee!" fell pierced with innumerable wounds.

FOOD AND FORCE.

ABSTRACT OF DR. ALBERT HINGSTON'S PAPER.

(Read January 26th, 1871.)

The lecturer enumerated the uses of food both in the vegetable and animal kingdoms, and described the effects of the different kinds of food on growth and development, and showed how every vegetable product, including even the seaweeds, served as food for one or more animals. After mentioning the ordinary classification of food, he stated that it was generally believed that every thought involved the destruction or consumption of the brain, and every action the destruction of mind, such destruction being in both instances immediately repaired by the aid of food. This he maintained was not universally true, but as a rule the brain converted the force lying hid in the food into thought and feeling, and the muscles into mechanical action, just as an engine converts the force lying hid in the coal into its own special action. He then inquired whence food obtained the force which could be thus converted, and in doing so he first described the law of the correlation of forces, which declared that though one force can be converted into another it cannot be lost. He showed that the grass and grain stored up as latent force the greater part of the heat they derived from the rays of the sun which shone upon them; that herbivorous animals whilst devouring the grain and grass concentrated this force; so that, when mutton or beef is devoured by us, we are consuming the force of the sun-rays which have been expended on some acres of ground for some weeks. This force he considered to resemble a wound-up spring—ready to expend itself at once, either as thought, feeling, or action, according to the requirements of the system. Food he thus showed to act in the animal economy in the same way as coal in a steam-engine, both containing latent force derived from the same source—the sun. He concluded his lecture by numerous examples and illustrations.

LOGIC, FORMAL AND MATERIAL.

ABSTRACT OF REV. J. M. CHARLTON'S PAPER.

(Read February 2nd, 1871.)

MISTAKEN views of the nature and powers of logic. Logic may be defined as the science, which investigates the laws of reasoning or inference; or more comprehensively, as the science which treats of the laws of thought. Definition of thought, in the logical sense of the term, and distinction of the matter and form of thought. On the basis of this distinction, two schools of logic have been formed in recent times; *the one*, essentially founded on the Organon of Aristotle, contends that logic is the science of the *formal* laws, or the *laws* which determine the *form* of thought, of which school the best representatives are Kant, Sir William Hamilton, and Professor Mansel. The *other*, essentially founded on the *Novum Organum* of Bacon, contends that logic is the science, exclusively, of the material laws, or the laws which determine the *matter* of thought, of which school the best representatives are Stuart Mill, Bain, and others. The main object of the lecturer was to find a basis of reconciliation between these rival schools. Accordingly he sought to prove:

I. That there is a material process of reasoning and thought which cannot be reduced to the forms of thought. This he endeavoured to prove in the instances of inductive and analogical reasoning. He submitted the utter irrelevancy of the inductive syllogisms alike of Whateley and Hamilton, and the analogical syllogism proposed by other logicians.

II. That there is a formal process of thought and reasoning, which is absolutely independent of its matter. This the lecturer sought to prove in the instance of *deductive* reasoning in general, which receives its formal expression in the syllogism. The attacks of Dr. Thomas Brown and Stuart Mill upon the syllogism were carefully examined, and the charge of *petitio principii* was refuted. Reasonings of Brown and Mill were analyzed and fairly reduced to syllogistic forms. Mill's own summary of his argument against the syllogism was shewn to be itself a syllogism, known among logicians as *celarent* in the first figure. In like manner Brown's

argument against the syllogism, condensed by himself into a a compact and telling form, was reduced to the logical form known as the dilemma. The reconciliation proposed by the lecturer, therefore, was, that logic should be defined as the science of the laws of thought, so as to comprehend both schools; and that the science of logic should be subdivided into formal and material, the first investigating the formal laws, and the second the material laws of thought, and so severally relegated to the two schools, which henceforth should co-operate in friendly association for the common purposes of general science.

AURORA BOREALIS.

ABSTRACT OF DR. HEARDER'S PAPER.

(Read February 9th, 1871.)

THE lecturer commenced by observing that the unusually brilliant display of the Aurora Borealis witnessed towards the close of the last year, particularly on the night of the 24th of October, had called forth remarks from different observers, scientific and unscientific, which seemed to show that there still remains a considerable amount of obscurity of idea as to the real cause and definite character of the phenomena, notwithstanding the researches constantly being made in electrical science.

The majority of observers seem to take it for granted that the phenomena which they witnessed were really the Aurora Borealis, whereas they were simply its refracted effects, the Aurora proper which produced them having been far below the northern horizon. They were, in fact, to the Aurora proper what twilight was to the sun, and the exquisitely varied tints which seemed to envelope the canopy of heaven were produced by the same atmospheric conditions that gave rise to the gorgeous hues which heralded the approach of the sun in the rosy morn, or which followed him after he had sunk below the western horizon with robes of golden light gradually fading into the soft and gentle twilight.

The Aurora, as we observed it in our latitudes, assumed two appearances, which were occasionally observable at the same time, but were distinct in their character. The one was a widely-diffused, mellow, translucent tint of red or crimson, varying in depth of colour, and variegated by other prismatic colours, and the other

consisted of pale white phosphorescent streams of light of a pyramidal form, which appeared to arise from the northern portions of the horizon, and extend with their pale luminous tips towards the zenith, and not unfrequently beyond it. Their motion was somewhat tremulous, and they gave the impression rather of rapid growth and development of the light in the peculiar form which it took than of the actual shooting of the light itself. In both cases the light of the stars was usually seen through it. Its elevation was so considerable as to be above all clouds, and when crimson was the prevailing colour, the clouds through which it was visible, and which partly intercepted the light, assumed the colour of violet, deeper in proportion to the density of the cloud and paler at the edges.

As we approached higher latitudes the phenomena increased in brilliancy, until, when near the poles, it shone out with all its splendour, not in the horizon, but in the zenith, diffusing its light on all sides, and partly compensating for the absence of the sun. The seasons of the year when it was most frequently visible were about the periods of the equinox, less during the winter, and still less during the summer.

Various causes had been assigned to these phenomena, but as scientific investigation had advanced they had been unquestionably proved to be electrical in their character, and to have been developed by atmospheric agencies, and it was the object of the present lecture to endeavour to show how these conditions were brought about. To this end it was necessary first to examine the different phenomena exhibited by electricity under various conditions, noticing the points of similarity between our artificial modes of developing it, and those observed during its production in the great laboratory of nature.

Electricity then was excited by various processes, evaporation and condensation being, however, the only two which were concerned in the subject of the evening. Every particle of moisture evaporated from the surface of the earth carried up a certain portion of electricity, which may be termed its normal quantity. The influence of heat modified the manifestations of this quantity. Increase of temperature increased the bulk of the vapour, and a development of negative electricity was the consequence. Condensation, on the other hand, diminished its volume, and the normal quantity thus appeared in excess, or positive.

It was a law in electricity that bodies in different electrical conditions attract each other; this held good whether they were electrified conductors or electrified non-conductors. The air was a non-conductor, and served to insulate the masses of condensed moisture, such as clouds, &c., but was able itself to take on and retain electrical conditions. Two clouds in different electrical states thus attracted each other, and approached until they were near enough to permit a restoration of equilibrium by the ordinary lightning discharge.

The lecturer proceeded to exhibit by experiment the phenomenon of lightning, and explained the nature of the apparatus for exploring the electricity of the atmosphere. The cause of the different appearances of lightning and the influence of the pressure of the atmosphere in modifying them, were exhibited, and protection from damage by lightning briefly alluded to. The atmospheric conditions of the Polar regions were shown to be such as to favour the production of electrical discharges on a grand scale. The moisture carried up into the higher regions of the atmosphere at the tropics contained a large supply of electricity; this was transferred by natural currents to the Poles. Here the moisture was condensed, and the electricity, as it were, expelled and left to reside in the non-conducting medium—the air, which thus became positively charged.

The attenuated condition of the atmosphere of the higher regions would not permit the retention of these electrical accumulations beyond a given point. As the change of atmospheric currents which occurred in the Polar regions gave rise to a change of electrical condition, the upper and lower strata frequently differed in their electrical polarities, and the discharges from one stratum into the other without the intervention of conductors, gave rise to the appearances recognized as the Aurora Borealis, and which were so correctly imitated by our electrical apparatus under similar conditions.

The light of these continuous electrical discharges spread far and wide through the upper regions of the atmosphere, and by the known laws of refraction, were visible at a greater or less distance, according to their intensity. The lecturer considered the variations in colour to arise chiefly from the different densities of the air in which the phenomena occurred, the crimson colour being developed where the attenuation was greatest, precisely analagous to the

crimson riband of light produced by the discharge from a powerful induction coil through an exhausted receiver containing a slight residue of atmospheric air. The other prismatic tints might be due to the decomposition of the light by the particles of moisture in the denser strata of the atmosphere.

Time would only allow a brief allusion to the connection between magnetism and the Aurora Borealis, and its probable effect on the chemical condition of the atmosphere in the development of ozone. The lecturer concluded by expressing his opinion that the Aurora Borealis depended much upon the meteorological conditions prevailing in the tropical regions during the previous summer season.

SULPHUR.

ABSTRACT OF MR. R. OXLAND'S PAPER

(Read February 16th, 1871.)

THE lecturer stated that sulphur is the basis of the chemical manufactures of the United Kingdom, its consumption amounting to about 1000 tons per diem. Although it is more frequently found in the native state than any other elementary body, yet it is principally characterised by its agency in mineralizing metals and other bodies, and by its forming remarkable constituents of organic bodies, both vegetable and animal.

Some of its principal minerals were shewn and described. Its Geological distribution was glanced at, and its physical and chemical properties illustrated. The combinations of sulphur with hydrogen, chlorine, carbon and the metals, were described and their uses illustrated. The methods of extracting sulphur from its ores, of refining it, and producing it in the varied forms of block, stick, sublimed, and milk were noticed, and the uses of it for the manufacture of gunpowder, for dusting vines to protect them against the vine disease, for the manufacture of vulcanized India Rubber, were described. Attention was specially directed to the combinations of sulphur with oxygen.

The properties of sulphurous acid as a bleaching agent, as an antichlore, as a disinfectant were illustrated, and its applicability for preserving meat and for the destruction of sewer gases pointed out.

The constitution of sulphuric acid was considered, the method

of manufacture explained, possibilities of improvement therein suggested.

Its use in the production of soda, chlorine, soap, candles, phosphorus, lucifer matches, lighting oils, and liquids and in the manufacture of superphosphate described, as well as its employment in the extraction of metals from their ores, and the preparation of costly dyes and most valuable medicines.

As a remarkable consequence of the recent greatly extended use of sulphuric acid for the manufacture of superphosphate, the Longmaid process for the extraction of copper from its ores, has been so extensively brought into operation, that in 1870 more than 400,000 tons of sulphur ores had been operated on, and the Tyne district has become an important copper smelting district.

By careful application of the knowledge of the relationship of sulphur to the many constituents of ores, it is now being attempted in Devon and Cornwall to utilize very large quantities of ores hitherto valueless, by the combined use of the Longmaid process and the new revolving calciner, so that instead of as hitherto one only of the constituents of an ore being rendered available, they may all be made so, thus bringing to maturity plans long since projected by the lecturer, for making scientific principles the basis of all metallurgical operations.

THE PHILOSOPHY OF ALFRED TENNYSON, POET-LAUREATE, AS DEDUCED FROM HIS WORKS.

PROGRAMME OF REV. T. W. FRECKELTON'S PAPER.

(Read February 23rd, 1871.)

General object of the lecture. Sense in which the word "philosophy" is used. Varying critical sentiment respecting the poet. The task he proposes to himself. The order of exposition of life and character. Birth and childhood. Senses versus the soul. Doubt and faith. Reasoning from analogy. The place of intuition. Reverence. Sin and death. Remorse. Penitence and forgiveness. Evil and good. Self-conquest. Will. The worship of sorrow. Love as an element of life. High morality. Patriotism. Progress. The relation of the sexes. Womanhood. Conclusion.

THE PRINCIPLES ON WHICH SHIPS' SAIL-CARRYING POWER AND STEADINESS IN A SEA-WAY DEPEND.

ABSTRACT OF MR. W. FROUDE'S PAPER.

(Read March 2nd, 1871.)

Apologetic admission of incompleteness and probable want of clearness, on the score of inexperience, personal defects, and greatly occupied time.

Stability and sea-worthiness principally considered under two aspects; namely, in respect of (1) stiffness and (2) steadiness.

"Stiffness" is the power to stand up under canvas, or resist upsetting forces.

Steadiness is the freedom from oscillation in a "sea-way."

"Stiffness" is more usually termed stability, which term is, however, misleading as seeming to imply steadiness also, although for the most part it produces "unsteadiness." Stiffness should first receive separate consideration. The conditions which govern steadiness will be found to depend on the conditions of stiffness taken in conjunction with the theory of waves.

The stiffness of a solid body resting on a solid is less characteristically different from that of a floating body than is popularly thought; since from inherent compressibility and extensibility of all substances, a solid body of whatever substance undergoes deflection or inclination when exposed to strain: a table on India-rubber legs represents, only in magnified form, what happens to one with timber legs.

Popular statement that a structure will stand so long as "the perpendicular of the centre of gravity falls within the base" shown to be not exact in principle, and often misleading.

Extract from letter of Mr. Brunel.

Terms "stable" and "unstable" equilibrium explained.

Archimedean principle that a body which displaces any part of a fluid receives a support equal to the weight of the fluid displaced. Popular proof of this.

Flotation happens when the weight of fluid displaced exceeds that of the displacing body.

With a wholly submerged body equilibrium happens when centre of gravity of displacing body is in the perpendicular of the centre of gravity of the fluid displaced. This centre termed the "centre of buoyancy," is the centre of support.

Mode of calculating the position of a centre of gravity, or finding it by experiment.

When the centre of gravity of the mass is perpendicularly above the centre of buoyancy the equilibrium is unstable; when below, it is stable. Measure of force of stability.

With a body floating at the surface a new condition arises, under which stable equilibrium may subsist, though the centre of gravity be above the centre of buoyancy.

This explained by the change of position imposed on the centre of support when the body is inclined, the surface of flotation giving increased displacement and support to the depressed side, diminished displacement and support to the elevated side. Mode of calculating the result of this condition.

Analogy of body resting on rockers, as a cradle, where, though inclination shifts centre of gravity to one side of the original point of support, the rocker supplies a new point of support shifted still farther in the same direction, thus securing return to original position.

The horizontal distance between the "vertical," drawn through the centres of gravity and support, measures the "righting force," or, as it is termed, "righting couple," or the "moment of stability." Explanation of the terms "couple" and "moment."

The compound condition thus arising is expressible in terms of an "effectual" or "virtual" point of support, termed the "metacentre;" a point in or belonging to the body such that, if used as a point of suspension for the body when removed from the water, it will give to the body the same tendency to become upright, as when afloat. The body is in neutral equilibrium if its centre of gravity be brought to its metacentre; and will be in unstable or in stable equilibrium, according as the centre of gravity be above or below the metacentre.

Simplest case of metacentre, that of a cylinder or other body turned in a lathe; where the metacentre is plainly in the axis of the body.

Mode of determining position of metacentre for other bodies.

Character of its gradual changes of position for bodies of less regular form when the inclination is increased.

These changes expressed by what is termed the "metacentric curve."

Corresponding form of "rockers" to give equivalent stability.

Popular error which attributes to this or that vessel the property that, while going easily to some considerable angle of inclination, great force is required to incline her farther.

Conditions under which such result is possible, involve abnormal form.

Opposite condition more common, as a consequence of submersion of edge of deck, or emersion of turn of bilge. "Low free board" and its consequence.

Reasons why greater stiffness is practically required and useful in small vessels than in large.

In large vessels sufficient stiffness attainable with centre of gravity relatively elevated.

Height of centre of gravity in large ships practically necessary with a view to steadiness in a sea-way—low centre causing great unsteadiness.

General problem of oscillation of floating body.

General analogy of ship afloat to pendulum.

"Period" of ship's oscillation depends partly on height of metacentre above centre of gravity, partly on lateral distribution of weights.

Character of oscillations when artificially initiated in still water. Their gradual extinction by friction and keel resistance.

Oscillations in a sea-way partly dependent on nature of wave motion.

Wave-motion implies translatory motion of particles, as well as slope of surface, and the slope corresponds with the translatory motion, so that the slope is virtually level to a body floating on it. Those who stand on a raft must stand square to the raft to avoid falling—deceptive estimate of wave-elevation consequent on this.

Old experiment of saucer whirled overhead without spilling the water. The surface would carry a stable floating body with mast upright to the water surface even while inverted.

Anatomy of wave, and law of wave slope—"period" of wave.

General condition that ship afloat always seeks to place its mast square to wave surface.

Character of consequent oscillations of ship depends on steepness of wave, and ratio of "wave period" to "ship's period."

Alternate accumulation of motion, and extinction of motion results when periods disagree.

Unlimited accumulation would result when periods concur, but for friction and keel resistance.

Primary aspect of these conditions is that diminution of "stiffness" produces "steadiness."

Limits to the application of this principle.

Other modes of limiting oscillation; namely, by increasing "friction" and "keel resistance."

Rapid extinction of a ship's oscillations in still water a criterion of her probable steadiness in sea-way.

Comparison between large and small waves.

Summary of results and general reflections.

THE CANADIAN YEAR-BOOK.

PROGRAMME OF MR. ROOKER'S PAPER.

(Read March 9th, 1871.)

The British possessions in North America, and their political distribution.

The discovery of Canada, and its colonization.

The Hudson's Bay Company, and its territory. The recent constitution of the dominion, and its Federal Government.

Scenery in Canada—its great rivers, lakes, and waterfalls.

The public works, railways, canals, timber slides. The trade of Canada, its climate, and agriculture. Education and emigration. The future of our colonial empire.

HUMAN AND BRUTE INTELLIGENCE.

AN INQUIRY INTO THE CONDITIONS WHICH DETERMINE THEIR DIFFERENCE.

ABSTRACT OF MR. F. H. BALKWILL'S PAPER.

(Read March 16th, 1871.)

Introduction. Instinct and reason now both allowed to be common to man with the lower animals. Instinct only a name of convenience. Definition of intelligence. Practically the power to see the relation of external things to the purposes of the being possessed of it, and in extension to see the relation of the being's own purposes to external things. The object of the lecture to shew that the first initial power is equally possessed by man and the brutes, whilst the intelligence of man alone is placed under conditions favourable to its extension.

Intelligence the attribute of a substance, and not a substance itself, proved by our consciousness of several states, such as feeling, willing, &c., which yet all belong to one individual. This substance spoken of as "the mind." Difference between the mind and the body proved, because one is always the same and indivisible, whilst the other is always being changed in substance and is capable of being divided. Intelligence can only grow by the efforts and experience of the mind that owns it, which, being indivisible, cannot transmit any to its offspring; therefore we must look for an explanation of the wonders of instinct to the organization of the body.

No innate difference in intelligence between man and the lower animals. The Tallegalla, a bird of Australia, makes use of artificial heat to hatch its eggs. Birds possess the sense of music and beauty, as evidenced by our song birds, Birds of Paradise, and the Bower bird. Animals abstract.

Instinct in error; instance given.

The conditions under which the intelligence is called to act divided into two heads—the organization of the body, and the sur-

rounding external world. The higher intelligence these conditions require for successful fulfilment the longer will the young require care. This deduction supported by reference to facts. Information handed down from one generation to another. Influence of sympathy of action leading animals to sociality. Migratory animals, otherwise living solitarily, congregate before starting on their journeys; thus probably handing down knowledge of the route from generation to generation. The five senses very similar in the human species and the brutes. An equal degree of similarity exists between their intelligence in respect to these senses.

Actions frequently repeated produce a co-ordination of the nervous and muscular systems; so that actions are performed under certain circumstances almost without the interference of the intelligence. This co-ordination capable of inheritance, and hence probably the explanation of apparently inherited mental characteristics.

Man's organization—probably the perfection of hand and brain—enables him to make and use tools, and so to vary his pursuits individually—a condition not attained by other animals.

Man enabled by spoken and written language to enlarge his experience, and hand down advancement in a manner quite beyond the attainments of the lower animals; and thus man alone, having variety of pursuit within his power, and having advancement and improvement beyond his own immediate experience placed within his reach by spoken and written language, is thrown under conditions for developing his intelligence to the reflective stage not possessed by the brutes.

GENIUS AND SUCCESS.

ABSTRACT OF MR. R. COLLIER'S PAPER.

(Read March 23rd, 1871.)

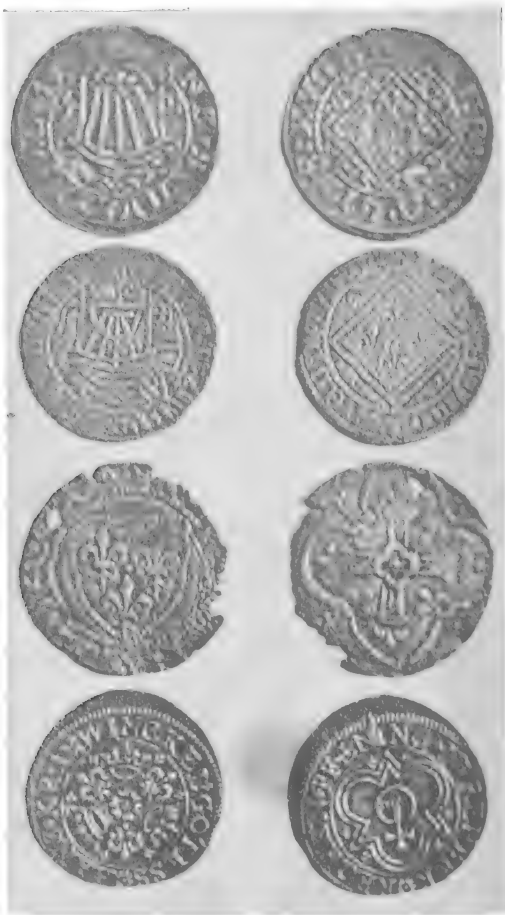
THERE is a fundamental difference of kind as well as of degree in the endowments of the human mind. The faculties which produce genius are generically different from those resulting in mere ability. The progress of knowledge decreases the difference in value between the two classes of intellect by narrowing the scope of genius and rendering systematisation more necessary. The disposition of mind conducive to genius is a love of bold investigation which refuses to take anything for granted, and keeps always recurring to first principles. The special faculty of genius is to turn every kind of knowledge that comes in its way to good account, and to see analogies and distinctions which escape ordinary minds. Genius may be divided into two great divisions—the artistic and the scientific form; and these forms are so different that a man of undoubted genius in the one is often unusually deficient in his power of appreciating the other. The ornamental form of genius is very difficult to treat of in connection with success. I therefore confine myself to enquiring how far genius of the scientific or useful kind is necessary or instrumental to success. In the three professions of politics, law, and medicine, the distinguishing characteristics of men of genius and successful men are especially remarkable. Political and legal genius are very nearly allied, the broad distinction between them being that the legislative efforts of the statesman are principally directed to the task of increasing the health, wealth, and power of the community; whereas the lawyer legislates for the security and permanent enjoyment of the blessings previously obtained by his colleague the statesman. We are indebted to the statesman for the means of acquiring our possessions, while the lawyer sees we are not obliged to part with them except in the regular way. The disposition necessary for success is totally different from that conducive to

genius. Men of genius are usually isolated and self-contained; successful men are aggressive, active, and observant of the thoughts and feelings of others. Men of genius are very unfit to deal with their fellow-creatures; they are absorbed in their discoveries, but don't know how to advertise them. They haven't an idea how stupid the world is, and consequently don't see their way to making it wiser. They are besides unskilful in contending with the prejudice, corruption, and malice of mankind. The statesman in particular has to deal with a seething mass of vanity, ambition, and corruption, and cannot possibly indulge himself in any Quixotic notions of honour, justice, or gratitude. As political morality improves it becomes less necessary for a statesman to be a man of the world; and latterly men have become eminent statesmen without that qualification. As regards the bar, there are three avenues to success—eloquence, law, and politics. Fortunately the value of mere legal attainments is going down in the market, and the political element proves more and more important. Since all reform, owing to the intricacies of the law, must come from within, it is important there should be some lawyers who have not had their capacity for taking broad views entirely knocked out of them by technical study. Sound lawyers combine the greatest amount of ability with the least amount of genius. Lawyers who succeed by eloquence, do good by importing a new kind of intellect into the study of the law, and by obliging the judges to listen to a little common sense. The artifices that lead to success are quite innumerable, and not to be learnt. Only a ready instinct can tell us when it is best to be natural and when to act. The bar is greatly improved by the sprinkling of political lawyers, who have an unusual scope for the display of genius, as they are allowed to do very much as they like. The medical profession is remarkable for the success of genius, and also of imposture. Genius seldom fails, but gross imposture very often succeeds. A doctor is judged rather by his successes than his failures; for his successes live and are seen, and his failures die and are forgotten. The duty of successful men is to be the interpreters of genius.

ON SOME ANCIENT JETTONS FOUND AT PLYMOUTH.

Two jettons, or Abbey pieces were found in the excavations for the new Plymouth Guildhall.

No. 1 was found by Mr. McGuire Bate upon the Hoe among the rubbish carted there from the site; and No. 2 was discovered under the foundation-stone of the house lately belonging to Mr. John Chalker by Mr. John Price.



No. 1 No. 1

No. 2 No. 2

No. 3 No. 3

No. 4 No. 4

The use of these jettons is not quite clear. They are pieces of base metal, or tin, intrinsically of very small value, and may have been used by the monks as cheques given out at the door of the monastery to the poor, and authorizing the recipient to a dinner on presenting the jetton at the buttery hatch; or, on the other hand, they may have been markers, or cheques which passed current as arbitrarily representing fixed sums of money, and used on making up the accounts between the different monasteries.

The jettons discovered were upon, or near to the actual site of the old Abbey of Plymouth, and other religious houses, and close to the church of St. Andrew, Plymouth. The legend cannot be deciphered, as the letters are very imperfect.

The impression on the coins represents on the one side a ship, and on the other four *fleurs de lys* in a square set on its corner. It is worthy of remark, that the seal of the Commonalty of Sutton, or South Town, now part of Plymouth, was in 1368 a ship upon waves, the legend being, "*Communitatis ville de Sutton super Plymmuth.*" (Oliver's *Monasticon Diocesis Exoniensis*, 130.) It may be observed that the present arms of the town of Plymouth shows four castles borne upon a ship.

The two, and the only jettons found, being precisely alike, may perhaps show that the stamp in use in the Plymouth Monasteries has been discovered; but this cannot be decidedly said without further proof.

Nos. 3 and 4 are jettons of Norfolk, and are set out to show the similarity of jettons all over the country.

The antiquarian will be interested in observing the singular arched chamber which extends under the building lately used as the Plymouth Corporation Grammar School, and which bears date 1615; also, the curious covered way, which has been traced for a considerable distance up Catherine Street, and may now be seen, having abruptly turned westward, in the south-west corner of the arched chamber, tending to prove that there may be some truth in the legend that the Monastery was connected by an underground passage,—in the one way extending to under the Hoe, and in the other to outside the old Frankfort Gate. The directions indicated by the covered way would exactly suit the tradition.

E. G. Bennett.

March 22nd, 1871.

REMARKABLE VARIATION IN THE SONG OF A WOOD WREN

(*Sylvia sylvicola, Penn.*);

WITH A FEW REMARKS ON SONG IN BIRDS.

On the 18th of June, 1870, when passing by a wood near Bickleigh, about six miles from Plymouth, I was startled at hearing a remarkable variation in the song of a Wood Wren (*Sylvia sylvicola, Penn.*) that was hopping and flitting about some trees in the wood. Sometimes its note would be just that of the species, the reiterated *twēē* alone; but often, after commencing with this, the bird would go on with a strain that seemed an imitation of the loud chattering notes of the Wren rather than those of any other bird, and I consequently concluded they were borrowed from this species. I listened again and again to the peculiar song with much astonishment, as we so seldom hear any bird in a state of nature copy the notes of another, though in confinement it is common enough for several species to imitate more or less the songs of others that they constantly hear, and blend the strange notes with their own. Still the fact of captive birds doing this does not prove the opinion held by Colonel Montagu, that the notes of birds are innate, not acquired, to be untrue, since animals when wild and when in confinement, from being subjected to most unlike conditions, act very differently. An exception is said to be necessary to prove a rule, and as such I would regard the remarkable variation in the song of the Bickleigh Wood Wren; for I entirely agree with the great ornithologist of Devon in considering the notes of wild birds as innate, not acquired; no, not even by the young from the parent birds. It would be useless for me to repeat here the very excellent arguments Colonel Montagu uses in support of this opinion, since anyone can find them in the "Ornithological Dictionary." He does not, however, make use of one which seems to me to have some force. It is this. The Cuckoo is hatched and reared by half a dozen different species, yet it maintains its own notes, unvaried and unmixed; but did young birds acquire their notes from the old ones, and not have them innately,

each Cuckoo would have those of the species that had fostered it.

We are told certainly sometimes in books of one bird or another being quite a mocking bird, and this has been asserted of our own Sedge Warbler (*Salicaria phragmitis*), a species common in summer in willow-beds and in low-lying hedges by streams or ponds near Plymouth. I maintain, however, that this bird has as definite a song as most others, and that it has acquired the reputation of being a mocking bird simply from the fact of many of its notes resembling most remarkably those of some other species; for we find different Sedge Warblers, all giving forth the same sequence of notes. *Here* will be the chatter as of the Blue Tit, *there* something like the alarm-note of the swallow in the songs of the whole lot. This would surely not be the case were the songs merely imitative, and not original.

In about six or seven weeks from the present time the Wood Wren and Sedge Warbler will both be here from a warmer clime, and I ask such readers of the *Journal* as have the requisite time, and the inclination, to pay particular attention to the songs of these birds. I venture to affirm they will not find one among a hundred of either giving forth any notes except those belonging to its species.

T. R. Archer Briggs.

March 8th, 1871.

NATURAL HISTORY NOTES.

On the 28th February, 1870, I was asked to go to the Plymouth Railway Station to see a large fish that had been taken in the Mackerel nets, and purchased by Mr. Davey, fish salesman. Unfortunately on my arrival at the Station I found that the *fish* was packed up in readiness to send to London by a train just starting, but I was able to see enough of it to ascertain that it was a cetacean and an uncommon species.

I wrote to Dr. Gray, by the evening post, telling him that the animal would be in the Columbia Market on the following morning, and asking him to send some one from the Museum to look after it and ascertain the species. I suppose, however, nothing was done, although Dr. Gray acknowledged my letter, and a rare specimen might have been lost;—as we shall see it had a narrow escape. The cetacean reached the Columbia Market in due course and was offered for sale. A customer soon presented himself—an enterprising individual—who mounted the carcase on a handcart roughly enclosed, and exhibited it (for a consideration) in the streets of London, loudly proclaiming the capture of a "sea monster, a cross between a Shark and a Whale." Fortunately the exhibition was met by Mr. Gerrard of the British Museum, who made a bargain with the proprietor.

The animal proved to be Risso's Grampus *(Grampus Rissoanus)* a very rare Mediterranean species. It was taken about twenty miles off the Eddystone. It was rather more than eleven feet long, weighed about seven hundred weight, and was a female. The species has been mentioned as British only once before, resting on the authority of a skull found by Mr. Berry.

Mr. Gosse writes me through a friend:—

"On August 5th, 1832, I was returning from Newfoundland to England, and was sailing up the British Channel close to the land. When just off Berryhead I saw under the ship's bow a large cetacean of a milky white hue, but appearing slightly tinged with

green from the intervening stratum of clear water. It was about sixteen feet long, with a round bluff head. It continued to swim along before the vessel's head, a few yards beneath the surface, for about ten minutes, maintaining our rate of speed which was five knots an hour; all which time I enjoyed from the bowsprit a very good view of it. It could have been no other than the White Whale, *Beluga albicans* of Linnæus, *B. borealis* of Lesson. I do not know that it has been seen on any other occasion in the Channel, though it has repeatedly occurred on the Scottish coast."

A very fine old male Hawfinch *(C. vulgaris)* was seen at Plympton, 24th December, 1870. These birds, once rare, seem to be now frequently observed.

Reference to the occurrence in the North of Devon of the Great Bustard *(O. tarda)*, by Mr. J. Gatcombe, will be found in the early numbers of *The Zoologist* for this year.

While writing I may as well mention that the Locusts which spread through England in such numbers in October, 1869, were after some time agreed on as being of the species *Acridium peregrinum.*

Our Associate, Mr. C. G. Bignell, writes:—

"It may be interesting to future entomologists to know that the past summer (1870) was very dry and hot, and that it produced many good things. Among the butterflies, the larvæ of *Vanessa polychloros* was abundant, one young collector having obtained a good supply by filling a quart strawberry basket with the larvæ taken from elm trees on the Saltash road, not far from the Devonport Workhouse. The Hawk-moths put in a good appearance; amongst them may be mentioned *Deilephila galii* and *livornica*, the perfect insect of the former having fallen to my lot to take at rest in a garden near my house, and the larvæ of the latter not far from it. Of the Clear-wings I took a number of *Sesia ichneumoniformis* and *philanthiformis*, at the Ramehead. I took the larvæ of *Acronycta leporina*, and found that the hairs on it did not take the direction described in Newman's "British Moths," "all directed backwards;" but found the hairs on the left side directed backwards, and on the right side

forwards, each hair slightly curved, the caterpillar having the appearance of being enclosed in a beautiful delicate silk-like cocoon, the head thereby concealed as *much* as the anal segment.

"With reference to the flight of Locusts, *Acridium peregrinum*, mentioned by Mr. Rowe (*Journal*, vol iv. p. 8), it is worthy of note that they occurred sparingly from Burton-on-Trent to Penzance, and I believe no record has been found of their previous occurrence in England. Their native home is Asia and Northern Africa. They arrived in England during the night of the 8th or morning of the 9th Oct., 1869. The prevailing wind around the British Isles and North of France was for some days easterly, and at Plymouth on the evening of the 8th it was south, and by the next morning S.E., the wind evidently in favour of the insects landing on this coast. The heat in the shade on the 8th and 9th was 74° and 76° Fahr. May not the temperature have influenced the migration?"

J. Brooking Rowe.

A LIST OF THE LECTURES

DELIVERED TO THE MEMBERS OF THE

PLYMOUTH INSTITUTION

FROM

THE COMMENCEMENT OF THE SESSION 1833–34

TO

THE END OF THE SESSION 1854–55.

PROCEEDINGS

OF

THE PLYMOUTH INSTITUTION.

In the year 1833 a Summary of the Proceedings of the Plymouth Institution for the Session 1832–33 was published, and prefixed was a list of the Lectures which had been delivered from October, 1813.

There is no printed record of the papers read from the close of the Session 1832–33 up to the time of the commencement of the publication of Annual Reports and Transactions, the first of which was issued in 1856. The Council has thought it desirable that the printed lists should be completed; and I have compiled from the Minute Books the following, commencing with the Session 1833–34, and concluding with the last lecture of the Session 1854–55.

In the Summary above alluded to it is stated that in 1812 lectures were delivered at the private residences of members; and Mr. J. N. Bennett in his interesting "Historical Sketch of the Origin and Progress of the Plymouth Institution," published in the Report and Transactions in 1868, refers to these early meetings. Mr. Bennett has presented to the Library a small book (given him by the late Dr. Cookworthy) containing entries of the proceedings of the Society in the years 1812–13. From this volume I find that a meeting was held at the residence of Mr. Henry Woollcombe, on Saturday, October 3rd, 1812. There were present Dr. Lockyer, Dr. Leach, Mr. William Eastlake, Mr. G. Eastlake, jun., Mr. W. Prance, Mr. A. B. Johns, Mr. George Ogg, Mr. William Prideaux, and Mr. Woollcombe; and it was resolved that "a Society should be formed for the purpose of delivering lectures on scientific as well as other subjects of interest during the ensuing winter." At subsequent meetings it was decided that the number of members should not exceed thirty; that there should be four presidents; that the meetings for the delivery of lectures should be held fortnightly; and that the society should be called the Plymouth Institute. The four first meetings were held at the houses of Mr. Henry Woollcombe and Mr. George Ogg, the remainder at the Plymouth Dispensary.

I give below the names of the officers and members of the Plymouth Institute, and a list of the papers read.

J. BROOKING ROWE.

March 15th, 1871.

PLYMOUTH INSTITUTE,

1812–13.

OFFICERS.

PRESIDENTS.

J. COLLIER COOKWORTHY, M.D. | WILLIAM PRANCE
EDMUND LOCKYER, M.D., F.L.S. | HENRY WOOLLCOMBE

TREASURER & SECRETARY,

GEORGE EASTLAKE, JUN.

ORDINARY MEMBERS.

James Adams
George Eastlake, sen.
William Eastlake
James Fox
Robert Were Fox
Samuel Fuge
John Hele Fuge
John Foulstone
John Rook Fletcher, M.A.
Henry Gandy
William Charles Hill, B.A.
Ambrose Bowden Johns
Henry Incledon Johns
Robert Lampen, B.A.
George Ogg
William Prideaux
Philip Rogers
C. Redding
George Soltau
John Tingcombe
Henry Welsford
Robert Wills
Samuel Williams

HONORARY MEMBERS.

William Elford Leach, M.D., F.L.S., London
Robert Were Fox, jun., Falmouth
John Murray, Edinburgh

1812.

Oct. 21 Mr. G. Ogg . . Pneumatics.
Nov. 19 Mr. James Fox . . Hydrostatics.
Dec. 3 Mr. H. Woollcombe . Observations on the causes of Bars being formed at the mouths of rivers in the counties of Devon and Cornwall, with suggestions why the late Embankments in the River Plym are not likely to injure the Harbour of Catwater, and likewise why the Breakwater now constructing is not likely to injure the Plymouth Sound.
14 Mr. J. Adams . . Architecture.
31 Mr. J. Adams . . Architecture.

1813.

Jan. 14 Dr. Cookworthy . . The Physiology of Plants and Animals.
28 Dr. Cookworthy . . " " "
Feb. 11 Mr. H. Welsford . . The History of Chemistry.
25 Mr. J. H. Fuge . . Caloric.
Mar. 11 Mr. G. Ogg . . Electricity.
25 Mr. James Fox . . Galvanism.
April 8 Mr. C. Redding . . The Origin, Characteristics, and Constituents of Poetry.

PLYMOUTH INSTITUTION.

SESSION 1833–34.

PRESIDENT.

MR. H. WOOLLCOMBE.

VICE-PRESIDENTS.

REV. R. LUNEY. MR. J. NORMAN. MR. W. PRANCE.

TREASURER.

MR. H. GANDY.

SECRETARY.

DR. E. MOORE.

CURATORS.

Library—REV. S. ROWE. *Apparatus*—MR. W. S. HARRIS.
Museum—MR. W. WYATT. *Athenæum*—MR. T. GRIFFIN.

1833.

Oct. 3	Mr. J. Ball Mr. W. S. Harris	Reports. { On the Fine Arts. / Progress of Science.
10	Mr. J. Prideaux	Thermo-Electricity.
17	Rev. B. St. John	Rhetoric.
24	Mr. W. S. Harris	Some new Phenomena of Electrical Attraction.
31	Mr. S. Purdon	Resources and Capabilities of Ireland.
Nov. 7	Mr. J. N. Hearder	Divisibility of Matter.
14	Mr. R. N. Barnes	Criticism.
21	Rev. S. Rowe	The English Language.
28	Mr. Jesse Adams	Rise and Progress of Gas Illumination.
Dec. 5	Mr. P. W. Swain	Insanity.
12	Mr. H. Woollcombe	Ancient and Modern Travelling in Devonshire.
19	Mr. H. Chatfield	Naval Architecture.
26	Mr. W. S. Harris	The Relations existing between Electricity, Magnetism, and Heat.

1834.

Jan. 2	Lieut.-Col. C. H. Smith	The Battle of Malplaquet.
9	Mr. W. Walker	The Tides.
16	Rev. B. St. John	Rhetoric.
23	Mr. R. N. Barnes	Moral Philosophy.
30	Mr. J. Prideaux	Linguistics.
Feb. 6	Mr. W. R. Bennett	Logic.
13	Dr. Budd	Sound.
20	Mr. J. Norman	An Essay on Art.
27	Rev. S. Nicholson	National Education.
March 6	Mr. S. Purdon	The Practicability of the Improvement of Ireland.
13	Mr. W. S. Harris	On Flame.

SESSION 1834–35.

PRESIDENT.

MR. H. WOOLLCOMBE.

VICE-PRESIDENTS.

REV. R. LUNEY. MR. R. N. BARNES.
LIEUT.-COL. C. H. SMITH.

TREASURER.

MR. H. GANDY.

SECRETARY.

DR. E. MOORE.

CURATORS.

Library—REV. B. ST. JOHN. *Apparatus*—MR. W. S. HARRIS.
Museum—MR. W. WYATT. *Athenæum*—MR. T. GRIFFIN.

1834.			
Oct.	9	Rev. Dr. Jacob	Greek Tragedy.
	16	Mr. S. Purdon	The Security of Capital expended in Irish Improvements.
	23	Rev. B. St. John	The Logical Method of Inquiry.
	30	Rev. R. Luney	Reasoning as a Science compared with Logic as an Art.
Nov.	6	Lieut.-Col. C. H. Smith	Affiliation of the Tribes of the Human Race.
	13	Mr. Dusantoy	The Age of Elizabeth.
	20	Mr. Wightwick	Architectural Varieties.
	27	Mons. Luce	The Literature of France.
Dec.	4	Rev. G. Smith	Memory.
	11	Mr. Hearder	Gaseous Combustion.
	18	Mr. H. Woollcombe	Public Records.
1835.			
Jan.	1	Mr. Owen	On the Consumption of Smoke by Combustion.
	8	Mr. W. Walker	Geological Changes resulting from Meteorological Agency.
	15	Mr. R. N. Barnes	Moral Philosophy.
	22	Mr. Chatfield	Naval Architecture.
	29	Mr. S. Purdon	On the Remedies for the Evils of Ireland.
Feb.	5	Mr. J. Prideaux	Thermo-Electricity.
	12	Rev. B. St. John	Deliberative Orations.
	19	Rev. Dr. Jacob	Education.
	26	Mr. P. W. Swain	On Poisons.
March	5	Mr. W. Wyatt	Comparative Anatomy.
	12	Rev. J. Webb	Capital Punishments.
	19	Mr. W. S. Harris	Electrical Attraction.
	26	Mr. W. S. Harris, Mr. J. Prideaux	Reports. Progress of Science. Progress of Chemistry.

SESSION 1835–36.

PRESIDENT.
MR. H. WOOLLCOMBE.

VICE-PRESIDENTS.
REV. R. LUNEY. REV. S. ROWE.
MR. J. NORMAN.

TREASURER.
MR. H. GANDY.

SECRETARY.
DR. E. MOORE.

CURATORS.
Library—REV. B. ST. JOHN. *Apparatus*—MR. W. S. HARRIS.
Museum—MR. W. WYATT. *Athenæum*—MR. G. WIGHTWICK.

1836.			
Oct.	1	Mr. J. Prideaux	Chemistry.
	8	Mr. Owen	Resistance of Fluids.
	15	Mr. Gabriel	Sketches of Character.
	22	Lt.-Col. Smith	Location of the Celtic Nations.
	29	Rev. S. Rowe	Utilitarianism.
Nov.	5	Mr. Wightwick	Pope.
	12	Mr. Swain	Circulation of the Blood.
	19	Mr. Swain	Respiration.
	26	Mr. S. Purdon	Sketch of the History of Ireland.
Dec.	3	Rev. G. Smith	Geology.
	10	Mr. Chatfield	The Classification and Armament of the British Navy.
	17	Rev. B. St. John	The Character of Deliberative Assemblies.
	24	Mr. Jesse Adams	Review of Gas Engineering.
	31	Lt.-Col. C. H. Smith	On the Location of the Gomerian Tribes.
1836.			
Jan.	7	Mr. D. Derry	Currency.
	14	Rev. G. Patey	The Moral Sense.
	21	Rev. J. Webb	Progress of Civilization.
	28	Rev. S. Rowe	On the Literature and Language of the Anglo-Saxons.
Feb.	4	Mr. T. Southwood	Geometry.
	11	Mr. Page	Gothic Architecture.
	18	Rev. Dr. Jacob	Physiological Botany.
	25	Mr. J. Prideaux	On Bleaching.
March	3	Mr. H. Woollcombe	On the Antiquities of Devon and Cornwall.
	10	Mr. C. Brown	Sonnets of Shakespeare.
	17	Mr. Hearder	The Atmosphere.
	24	Rev. R. Luney	The Intellectual Character and Prospects of the Present Age.

SESSION 1836–37.

PRESIDENT.

MR. H. WOOLLCOMBE.

VICE-PRESIDENTS.

REV. R. LUNEY. MR. PRANCE.
MR. CHATFIELD.

TREASURER.

MR. H. GANDY.

SECRETARY.

DR. E. MOORE.

CURATORS.

Library—MR. C. BROWN. *Apparatus*—MR. W. S. HARRIS.
Museum—MR. WYATT. *Athenæum*—MR. WIGHTWICK.

1836.			
Oct.	6	Mr. Woollcombe	Report British Association.
	13	Lt.-Col. C. H. Smith	Celtic Institutions.
	20	Rev. R. N. Barnes	Character and Writings of Dr. Johnson.
	27	Mr. Purdon	Sketch of the History of Ireland.
Nov.	3	Mr. T. Lloyd	The Steam Engine.
	10	Mr. C. Brown	Literary History of Florence.
	17	Mr. A. B. Johns	Painting.
	24	Mr. Kerr	On the Fixed Stars.
Dec.	1	Mr. W. S. Harris	Electric Light.
	8	Rev. G. Smith	Witchcraft.
	15	Mr. J. Prideaux	On a Tour into Germany and Switzerland.
	22	Mr. J. Owen	On the Economy of Fuel.
	29	Mr. C. Brown	On the Life and Poems of John Keats.
1837.			
Jan.	5	Mr. W. Walker	On the Resistance of the Atmosphere to the Flight of Projectiles.
	12	Mr. J. Mavor Brown	Animal & Vegetable Physiology compared.
	19	Mr. J. M. Rendel	Railways.
	26	Mr. H. Woollcombe	Antiquarian Researches in Devon and Cornwall.
Feb.	2	Rev. B. St. John	Religion and Learning of the Hindoos.
	9	Mr. Norman	On the Influence of Fine Arts on National Prosperity.
	16	Mr. Purdon	Sketch of the History of Ireland.
	23	Mons. Luce	Literature of France.
March	2	Mr. J. Prideaux	Switzerland.
	9	Mr. Southwood	Isothermal Lines.
	16	Rev. S. Rowe	The Credibility of Moral Evidence.
	23	Mr. G. Wightwick	The Romance of Architecture.

SESSION 1837–38.

PRESIDENT.
MR. H. WOOLLCOMBE.

VICE-PRESIDENTS.
REV. R. LUNEY. MR. W. S. HARRIS. MR. C. BROWN.

TREASURER.
MR. H. GANDY.

SECRETARY.
DR. E. MOORE.

CURATORS.
Library—REV. G. PATEY. *Apparatus*—MR. KERR.
Museum—MR. BELLAMY. *Athenæum*—MR. WIGHTWICK.

1837.

Oct.	5	Lieut.-Col. Smith	The Celtæ. (Christian Period.)
	12	Mr. Swain	The Physiology of Digestion in the Human Subject.
	19	Mr. C. Brown	The Learning of Shakespeare.
	26	Mr. C. Brown	On Shakespeare in reference to his Knowledge and Dramatic Art.
Nov.	2	Mr. Lloyd	On the Application of Steam Power to Locomotion.
	9	Mr. P. F. Bellamy.	Osteology.
	16	Mr. W. J. Henwood	On Metalliferous Veins of Cornwall.
	23	Lt.-Col. Dunsterville	On the British Military Power in India.
	30	Rev. G. Smith	Druidism.
Dec.	7	Mr. Chatfield	British Dockyards.
	14	Mr. T. Peters	The Life of Galileo Galilei.
	21	Mr. A. Rooker	International Law.
	28	Mr. W. J. Henwood	Theory of Metalliferous Veins.

1838.

Jan.	4	Rev. G. Patey	Grammar.
	11	Dr. Row	Respiration.
	18	Mr. J. L. Colley	Fine Arts.
	25	Rev. B. St. John	On the Construction of a Brief for Counsel.
Feb.	1	Mr. G. Page	Saxon and Norman Architecture.
	8	Mr. C. Brown	Milton's Comus.
	22	Mr. J. N. Bennett	Trial by Jury.
March	1	Rev. R. Luney	Style in the English Language.
	8	Rev. S. Rowe	On the Influence of Railroads on National Character.
	15	Mr. H. Woollcombe	Antiquarian Researches in Devon and Cornwall.
	22	Mr. J. Prideaux	Metallurgy.
	29	Mr. W. Walker	Seamanship—Practical and Theoretical.

SESSION 1838–39.

PRESIDENT.

MR. H. WOOLLCOMBE.

VICE-PRESIDENTS.

MR. W. WALKER. MR. C. BROWN. REV. R. LUNEY.

TREASURER.

MR. H. GANDY.

SECRETARY.

DR. E. MOORE.

CURATORS.

Library—REV. G. PATEY. *Apparatus*—MR. W. KERR.
Museum—MR. P. F. BELLAMY. *Athenæum*—MR. G. WIGHTWICK.

1838.			
Oct.	4	Rev. B. St. John	. Comparison between the Hindoo, Phœnician and other Ancient Cosmogonies.
	11	Mr. Swain	. Physiology.
	18	Rev. R. N. Barnes	. The Writings of Dr. Johnson.
	25	Mr. J. Prideaux	. Metallurgy—Lead.
Nov.	1	Mr. J. Owen	. Metallurgy—Iron.
	8	Dr. E. Moore	. Lime Rocks of Devonshire.
	15	Mr. E. Fry	. Entomology.
	22	Mons. Luce	. Literature of France—Froissart's Chronicles.
	29	Rev. G. Smith	. Mohammed.
Dec.	6	Mr. J. L. Colley	. Fine Arts—Composition.
	13	Dr. Row	. The Circumstance affecting the Health of Communities.
	20	Dr. E. Moore	. Geology of Devonshire.
	27	Mr. W. Snow Harris	. The Electro-Magnetic Telegraph.
1839.			
Feb.	7	Mr. G. Wightwick	. Architectural Practice.
	14	Mr. H. Woollcombe	. England and Civilization.
	21	Mr. T. Peters	. Mathematical Geography.
	28	Mr. A. Rooker	. International Law.
March	7	Mr. P. F. Bellamy	. Anatomy of the Eye.
	14	Mr. D. Derry	. The Money Pressure of 1836–37.
	21	Mr. W. Walker	. Seamanship—Practical and Theoretical in reference to Storms.
	28	Rev. G. Smith	. Scandinavia.
Apl.	4	Mr. C. Brown	. Influence of Italian on English Literature.
	11	Lt.-Col. C. H. Smith	. Ancient Signa or Banners.
	18	Rev. B. St. John	. Comparison of Ancient Cosmogonies.
	25	Rev. R. Luney	. Ancient English Poetry.

SESSION 1839–40.

PRESIDENT.

MR. H. WOOLLCOMBE.

VICE-PRESIDENTS.

MR. W. PRANCE. REV. R. N. BARNES.
MR. G. WIGHTWICK.

TREASURER.

MR. H. GANDY.

SECRETARY.

DR. E. MOORE.

CURATORS.

Museum—MR. P. F. BELLAMY. *Apparatus*—MR. W. S. HARRIS.
Library—REV. G. PATEY. *Athenæum*—MR. G. PAGE.

1839.			
Oct.	3	Rev. G. Smith	. The Advantage of Literary and Scientific Institutions.
	10	Mr. A. Stewart	. Serpent Worship.
	17	Rev. S. Rowe	. Colonists and Aborigines.
	24	Mr. P. W. Swain	. The Nervous System.
	31	Mr. P. W. Swain	. The Nervous System.
Nov.	7	Rev. B. St. John	. Principles of Oratory.
	14	Mr. E. Fry	. Entomology.
	21	Mons. Luce	. The History of France.
	28	Mr. P. F. Bellamy	. On the Circulation of the Blood in the Vertebrata.
Dec.	5	Mr. Lancaster	. The Measurement of Time.
	12	Dr. E. Moore	. The Raised Beaches of Devonshire.
	19	Mr. W. Walker	. The Progression, Rotation, and Recurvature of Storms.
1840.			
Jan.	16	Rev. G. Patey	. Homer.
	23	Mr. A. Stewart	. Serpent Worship.
	30	Mr. J. N. Bennett	. Social Systems.
Feb.	6	Mr. W. S. Harris	. Gravitation.
	13	Lt.-Col. C. H Smith	. Ancient Signa.
	20	Mr. J. Prideaux	. Metallurgy—Tin.
	27	Rev. R. N. Barnes	. Wordsworth.
March	5	Mr. A. Rooker	. Ancient Forensic Oratory.
	12	Mr. W. S. Harris	. On the Lateral Discharge in Electricity.
	19	Rev. G. Smith	. Saracenic History subsequent to the Time of Mohammed.
	26	Rev. B. St. John	. The Principles of Oratory.
Apl.	2	Mr. G. Wightwick	. The Writings of Shakespeare.

SESSION 1840–41.

PRESIDENT.

MR. H. WOOLLCOMBE.

VICE-PRESIDENTS.

REV. R. LUNEY. MR. W. PRANCE.
MR. J. N. BENNETT.

TREASURER.

MR. H. GANDY.

SECRETARY.

DR. E. MOORE.

CURATORS.

Library—REV. G. PATEY. *Apparatus*—MR. W. S. HARRIS.
Museum—REV. B. ST. JOHN. *Athenæum*—MR. G. WIGHTWICK.

1840.

Oct.	1	Mr. J. Owen	. The Method of Induction.
	8	Dr. E. Moore	. The Landslip at Axmouth.
	15	Dr. Vaux	. Iron.
	22	Mr. P. W. Swain	. Physiology of the Brain in reference to Phrenology.
	29	Rev. B. St. John	. On the Principles of Oratory.
Nov.	5	Mr. Hearder	. Arnott's Stoves.
	12	Mr. Walker	. Formation and Destruction of Harbours.
	19	Mr. J. Prideaux	. Metallurgy—Copper.
	26	Mr. A. H. Bampton	. Railway Transport.
Dec.	3	Mr. J. L. Colley	. Fine Arts—Light and Shade.
	10	Mr. A. Rooker	. Forensic Oratory.
	17	Mr. W. S. Harris	. Gravitation.

1841.

Jan.	7	Mr. H. Woollcombe	. On the Early History of Devonshire.
	14	Dr. Vaux	. Vegetable Physiology Connected with Horticulture.
	21	Mr. H. Woollcombe	. Remarks on the Defects of Devonshire Farming.
	28	Major Lindam	. On the Three Languages descended from the Teutonic—the Anglo-Saxon, the Danish, and the German.
Feb.	4	Rev. G. Smith	. Origin of Language.
	11	Mr. D. Derry	. The Currency.
	18	Mr. Walker	. Heat and Combustion in Condensed Air.
	25	Mr. H. Chatfield	. Naval Architecture. Iron Ships, and Propulsion by the Archimedean Screw.
March	4	Rev. R. Luney	. The Education of the Higher and Middle Classes of Society.
	11	Rev. B. St. John	. The Currency.
	18	Mr. G. Wightwick	. Shakespeare (first part of Henry IV.)
	25	Mr. G. Wightwick	. Shakespeare (second part of Henry IV.)

SESSION 1841–42.

PRESIDENT.

MR. H. WOOLLCOMBE.

VICE-PRESIDENTS.

REV. R. LUNEY. MR. CHATFIELD.
MR. W. WALKER.

TREASURER.

MR. H. GANDY.

SECRETARY.

DR. E. MOORE.

CURATORS.

Library—MR. A. ROOKER. *Apparatus*—MR. W. S. HARRIS.
Museum—MR. SWAIN. *Athenæum*—MR. WIGHTWICK.

1841.		
Oct. 7	Mr. H. Chatfield	. Elements of Naval Construction.
14	Mr. H. Woollcombe	. Population of Plymouth, Devonport, and Stonehouse.
21	Mr. J. Prideaux	. Metallurgy—Copper.
28	Mr. W. Walker	. Hourly Inequality of the Tides.
Nov. 4	Mr. P. W. Swain	. Comparative Influence of Cultivation in the Development of the Intellect.
11	Mr. P. W. Swain	. Influence of Physical Conformation in Development of Intellect.
18	Mr. E. Lane	. Reason and Instinct.
25	Mr. H. Woollcombe	. Statistics of Plymouth, Devonport, and Stonehouse.
Dec. 2	Rev. G. Smith	. Civilization of Africa.
9	Rev. G. Smith	. Civilization of Africa.
16	Mr. J. Prideaux	. Agricultural Chemistry in reference to Manures.
23	Mr. J. Prideaux	. Theory and Practice of Manures.
1842.		
Jan. 13	Mr. G. Wightwick	. The Fine Arts. House of Commons' Committee Report.
20	Dr. Vaux	. Horticulture.
27	Mr. E. Lane	. Unity of the Origin of Human Race.
Feb. 3	Mons. Onffroy	. Education.
10	Mr. Raddall	. Anatomy and Diseases of the Horse's Foot.
17	Mr. W. S. Harris	. Electrical Conduction.
24	Mr. A. Rooker	. The Prose Writings of Milton.
March 3	Dr. E. Moore	. On the Investigations of Professor Owen in regard to Fossil Geology.
10	Mr. Walker	. Ocean Waves.
17	Rev. R. N. Barnes	. Pauper Education.
24	Rev. R. Luney	. Ancient and Modern Oratory.

SESSION 1842–43.

PRESIDENT.

MR. H. WOOLLCOMBE.

VICE-PRESIDENTS.

REV. R. LUNEY. MR. J. OWEN.
MR. A. ROOKER.

TREASURER.

MR. H. GANDY.

SECRETARY.

DR. E. MOORE.

CURATORS.

Library—REV. P. HOLMES. *Apparatus*—MR. W. S. HARRIS.
Museum—MR. SWAIN. *Athenæum*—MR. WIGHTWICK.

1842.			
Oct.	6	Mr. H. Woollcombe	. The Opening of National Repositories to the Public.
	13	Mr. Hearder	. Electricity.
	20	Mr. P. W. Swain	. Medical Jurisprudence.
	27	Mr. P. W. Swain	. Medical Jurisprudence.
Nov.	4	Mr. Fuge	. The Evolution of Light from Organic and Inorganic Bodies.
	11	Mr. Rooker	. Judicial Proceeding among the Anglo-Saxons.
	18	Dr. Moore	. Liebig's Animal Chemistry.
	25	Mr. J. Prideaux	. Vegetable Susceptibility to Stimulation.
Dec.	1	Mr. J. Prideaux	. Stimulating Action of Manures.
	8	Rev. P. Holmes	. Ancient and Modern British Church Architecture.
	15	Mr. Lancaster	. Howard's Cycle of the Seasons.
	22	Mr. Raddall	. External Conformation of the Horse.
1843.			
Jan.	12	Mr. Hearder	. Electricity.
	19	Mr. J. L. Colley	. Sculpture.
	26	Mr. J. Prideaux	. Application of Science to Agriculture.
Feb.	2	Mr. J. Owen	. The Mechanical Centres.
	9	Mr. H. Woollcombe	. The Roman Period in Devon.
	16	Mr. Wightwick	. Church Architecture.
	23	Rev. P. Holmes	. Colonization.
March	2	Mr. A. Rooker	. Milton's Minor Poetry.
	9	Mr. Hearder	. Electricity—Lateral Discharge.
	16	Mr. G. Shortland	. Constitutional History of England.
	23	Mr. Walker	. The Mariner's Compass.

SESSION 1843–44.

PRESIDENT.

MR. H. WOOLLCOMBE.

VICE-PRESIDENTS.

MR. PRANCE. MR. ROOKER. MR. SWAIN.

TREASURER.

MR. H. GANDY.

SECRETARY.

DR. E. MOORE.

CURATORS.

Library—REV. P. HOLMES. *Apparatus*—MR. W. S. HARRIS, F.R.S.
Museum—DR. SOLTAU. *Athenæum*—MR. WIGHTWICK.

1843.			
Oct.	2	Mr. A. Rooker	. The British Association at Cork.
	9	Mr. H. Woollcombe	. The Saxon Period in Devon.
	16	Mr. J. L. Colley	. Sculpture.
	23	Mr. P. W. Swain	. Medical Jurisprudence.
	30	Mr. P. W. Swain	. Medical Jurisprudence.
Nov.	6	Mr. J. Prideaux	. Agricultural Chemistry—Salt.
	13	Mr. E. Lane	. Moral and Intellectual Advantages of Natural History.
	20	Mr. E. Lane	. Advantages of Natural History.
	27	Dr. Soltau	. History and Nature of Epidemics.
Dec.	4	Mr. Raddall	. The External Conformation of the Horse.
	11	Mr. J. Pyer	. Evils and Impolicy of War.
	18	Dr. E. Moore	. Mesmerism.
1844.			
Jan.	8	Mr. J. N. Bennett	. National Education.
	15	Mr. W. Lancaster	. Comets.
	22	Mr. W. S. Harris	. The Phenomena of Winds.
	29	Rev. P. Holmes	. The Affinity of Languages.
Feb.	5	Rev. P. Holmes	. The Affinity of Languages.
	12	Mr. A. H. Bampton	. The Utility of Cemeteries in the Vicinity of Large Towns.
	19	Mr. Hearder	. Electro-Magnetism as a Moving Power.
	26	Mr. A. Rooker	. Lunacy—its Legal Incidents.
Mar.	4	Mr. Walker	. Magnetism of the Mariner's Compass.
	11	Mr. Shortland	. Constitutional History of England.
	18	Rev. S. Rowe	. The Dark Ages.

SESSION 1844-45.

PRESIDENT.

MR. H. WOOLLCOMBE.

VICE-PRESIDENTS.

MR. W. PRANCE. REV. P. HOLMES. MR. J. N. BENNETT.

TREASURER.

MR. H. GANDY.

SECRETARY.

DR. E. MOORE.

CURATORS.

Library—REV. G. H. PARMINTER. *Apparatus*—MR. W. S. HARRIS.
Museum—MR. SWAIN. *Athenæum*—MR. WIGHTWICK.

1844.			
Oct.	3	Mr. Wightwick	Cathedrals of England.
	10	Mr. Hearder	Electro-Magnetism.
	17	Mr. Raddall	Hydrophobia as manifested in the Horse and Dog.
	24	Mr. P. W. Swain	Recent Improvements in the Microscope.
Nov.	7	Mr. J. Prideaux	Chemical Analysis.
	14	Dr. E. Moore	The Operation of the Quarantine Laws.
	21	Mr. Rooker	Lunacy—its Legal Incidents.
	28	Mr. Lancaster	The Cycle of the Seasons.
Dec.	5	Mr. R. Bishop	Sound.
	12	Rev. G. Davis	The Past Condition and Future Prospect of the Jews.
	19	Mr. G. Wightwick	Cathedrals of England.
Jan.	9	Mr. Hearder	Electro-Magnetism.
	16	Mr. Hearder	Electro-Magnetism.
	23	Rev. P. Holmes	The Formation of the Modern Languages of Europe.
	30	Rev. P. Holmes	The Recent Discovery of Ancient Writings engraved on the Rocks and Walls of Houses near Aden, and in various parts of Hydramaut, on the Coast of Arabia.
Feb.	6	Mr. J. N. Bennett	National Education.
	13	Mr. E. Lane	The Love of Nature.
	27	Mr. D. Derry	Currency.
Mar.	6	Mr. J. Norman	Landscape Painting.
	13	Mr. G. Shortland	Constitutional History of England.
	20	Mr. W. Walker	Magnetism of Ships and the Mariner's Compass.
	27	Dr. Soltau	Hydropathy and other Panaceas of the Day.

SESSION 1845–46.

PRESIDENT.

MR. H. WOOLLCOMBE.

VICE-PRESIDENTS.

MR. G. SHORTLAND. MR. D. DERRY. MR. W. WALKER.

TREASURER.

MR. H. GANDY.

SECRETARY.

DR. E. MOORE.

CURATORS.

Library—REV. G. H. PARMINTER. *Apparatus*—MR. W. S. HARRIS.
Museum—MR. SWAIN. *Athenæum*—MR. WIGHTWICK.

1845.		
Oct. 2	Mr. Wightwick	Landscape Art. The Oxford Graduate.
9	Dr. Letheby	Animal Electricity.
16	Mr. Prideaux	The Potato Blight.
23	Mr. Hearder	Magneto-motive Mechanics.
30	Mr. P. W. Swain	Primary Organization Microscopically developed.
Nov. 6	Dr. E. Moore	Phenomena of Volcanoes.
13	Mr. E. Fry	Mesmerism.
20	Mr. G. Sanders	Gas Meters.
27	Mr. A. Rooker	The Rise of the Italian Republics.
Dec. 4	Mr. J. L. Colley	Principles of the great Schools of Painting.
11	Rev. P. Holmes	Shakespeare as a Poet.
18	Mr. Hearder	Combustion.
1846.		
Jan. 22	Dr. Soltau	Lunatic Asylums.
29	Mr. T. Lancaster	Telescopic Discovery of the Fixed Stars.
Feb. 5	Mr. R. Bishop	Cotton Manufacture.
12	Mr. G. Shortland	Utility and Necessity of Medical Evidence in Prisons and Workhouses.
19	Mr. O. C. Arthur	Pompeii.
26	Mr. Raddall	Best Mode of Feeding Horses.
March 5	Mr. Walker	Dimensions, Forms, & Properties of Ships.
12	Mr. G. Shortland	The necessity of Medical Evidence in the Establishment of Legislative Enactments in cases of Quarantine and the Regulation of Dietaries in Prisons and Workhouses.
19	Rev. S. Rowe	The Dark Ages.

SESSION 1846-47.

PATRON.
HENRY WOOLLCOMBE.

PRESIDENT.
MR. W. PRANCE.

VICE PRESIDENT.
MR. A. ROOKER.

TREASURER.
MR. J. L. COLLEY.

SECRETARY.
MR. W. H. PRANCE.

CURATORS.

Library—DR. SOLTAU. *Apparatus*—MR. W. S. HARRIS.
Museum—DR. E. MOORE. *Athenæum*—MR. WIGHTWICK.

1846.

Oct.	1	Rev. S. Rowe	Dartmoor Antiquities.
	8	Dr. E. Moore	Agricultural Capabilities of Dartmoor.
	15	Mr. P. W. Swain	On some recent Discoveries in Science.
	22	Mr. Hearder	
	29	Mr. Lancaster	Telescopic Studies.
Nov.	5	Mr. J. L. Colley	Haydon—his Lectures.
	12	Mr. J. N. Bennett	National Education.
	19	Mr. A. Rooker	The Decline of European Literature, and its Revival in the Middle Ages.
	26	Mr. J. Prideaux	Ventilation.
Dec.	3	Mr. G. Wightwick	Landscape Art. The Oxford Graduate.
	10	Mr. Shortland	Medical Jurisprudence.
	17	Mr. Chatfield	The Steam Navy of Great Britain.

1847.

Jan.	7	Dr. Soltau	Infanticide.
	14	Mr. Wightwick	Macbeth.
	21	Mr. Sanders	Fuel.
	28	Mr. Fry	Art Unions.
Feb.	4	Mr. W. Hughes	Fisheries and Fish Markets.
	11	Mr. W. S. Harris	Atmospheric Railways.
	18	In consequence of the death of Mr. Woollcombe on the previous Sunday the Society did not meet on this evening.	
	25	Rev. P. Holmes	Byron and Wordsworth.
March	4	Rev. S. Newth	Influence of the Religion of Ancient Rome on the popular mind at the commencement of the Christian Era.
	11	Rev. R. Luney	Modern Oratory.
	18	Mr. Walker	Navigation—Practical and Theoretical.

SESSION 1847–48.

PRESIDENT.
SIR WILLIAM SNOW HARRIS.

VICE-PRESIDENT.
DR. SOLTAU.

TREASURER.
MR. J. L. COLLEY.

SECRETARY.
MR. W. H. PRANCE.

CURATORS.

Library—MR. A. ROOKER. *Apparatus*—MR. SWAIN.
Museum—DR. MOORE. *Athenæum*—MR. WIGHTWICK.

1847.			
Oct.	7	Rev. S. Rowe	Retrospect & Prospects of the Institution.
	14	Mr. Hearder	Magnetism.
	21	Mr. Swain	The Inductions of Physical Science.
	28	Mr. Swain	Vestiges, Cosmos, Nichols, and Lord Ross.
Nov.	4	Mr. Prideaux	Construction of Chimneys.
	11	Mr. Fry	Art Unions.
	18	Mr. Lancaster	Telescopic Study of the Heavens.
	25	Dr. Moore	Mineral Springs—their Causes and Medical Influences.
Dec.	2	Mr. Hearder	Galvanism.
	9	Mr. A. Norman	Principles of Architectural Design.
	18	Mr. A. Rooker	On the Philosophical Fictions of Sir Thos. Moore, Bacon, and Swift.
1848.			
Jan.	6	Dr. Soltau	Drowning.
	13	Mr. Bampton	Supply of Water to Towns.
	20	Sir William S. Harris	Observations on Electrical Attraction.
	27	Mr. J. N. Bennett	Penal Legislation.
Feb.	3	Rev. P. Holmes	Shakespeare Ethically considered.
	10	Mr. Hughes	Law of Primogeniture.
	17	Mr. Shortland	Medical Jurisprudence.
	24	Mr. G. Sanders	Cooking by Gas.
March	3	Mr. Colley	Public Cemeteries.
	10	Rev. R. Luney	Modern Oratory.
	17	Mr. Walker	On the Irregularity of the Crust of the Earth.
	24	Mr. Wightwick	Architecture generally considered and Pictorially Illustrated.

The Minutes of the Proceedings for the Sessions 1846-47 and 1847–48 are not so complete as those of previous years. The Lists of Lectures are taken from the Prospectus issued at the commencement of each Session, in which alterations may have occurred.

SESSION 1848–49.

PRESIDENT.

MR. GEORGE WIGHTWICK.

VICE-PRESIDENTS.

MR. J. N. BENNETT. MR. D. DERRY.
COL. DUNSTERVILLE.

TREASURER.

MR. J. L. COLLEY.

SECRETARY.

DR. MOORE.

CURATORS.

Library—MR. A. ROOKER. *Apparatus*—SIR W. S. HARRIS.
Museum—MR. W. H. PRANCE. *Athenæum*—MR. A. H. BAMPTON.

1848.			
Oct.	5	Dr. Soltau	Asphyxia.
	12	*Mr. E. Lane	Birds of Shakespeare.
	19	Dr. E. Moore	Coral Islands.
	26	*Mr. Oxland	Mines and Minerals of Devon.
Nov.	2	Mr. Hearder	Gutta Percha and its applications.
	9	*Col. C. H. Smith	Addenda to Natural History of Man.
	16	Mr. A. Rooker	Civilization in the Reign of Elizabeth.
	23	*Mr. D. Sargent	Man—his Social State.
	30	Mr. J. N. Bennett	Civilization.
Dec.	7	*Mr. Jago	Natural History of Bees.
	14	Sir W. S. Harris	On Electrical Theories.
	21	*Dr. Sheppard	Physiology of Nutrition.
1849.			
Jan.	11	Mr. A. H. Bampton	Drainage of Towns.
	18	*Dr. Cocks	Marine Botany.
	25	Mr. D. Derry	Currency—Commercial Distress of 1847.
Feb.	1	*Mr. Hearder	Electro-physiology.
	8	Mr. Hughes	The Law of Wills.
	15	*Mr. R. Parker	Woman—her Mental Characteristics.
	22	Mr. G. Shortland	Medical Jurisprudence.
March	1	*Mr. Bellamy	Comparative Anatomy.
	8	Mr. Wightwick	Shakespeare.
	15	*Mr. I. W. N. Keys	Botany of the Neighbourhood.
	22	Mr. Osward Arthur	Architecture as one of the Fine Arts.
	29	*Mr. Harper	Retrospective Address of Natural History Society.

The Lectures marked thus * were delivered by members of the Devon and Cornwall Natural History Society, proposals for the amalgamation of the two Societies having been made. The experiment did not answer, and was not repeated.

SESSION 1849-50.

PATRON.

RIGHT HON. THE EARL OF MORLEY.

PRESIDENT.

DR. SOLTAU.

VICE-PRESIDENTS.

MR. G. WIGHTWICK. MR. J. N. BENNETT.
COL. DUNSTERVILLE.

TREASURER.

MR. J. L. COLLEY.

SECRETARY.

DR. E. MOORE, F.L.S.

CURATORS.

Library—MR. A. ROOKER. *Apparatus*—SIR W. S. HARRIS, F.R.S.
Museum—MR. W. H. PRANCE. *Athenæum*—MR. A. H. BAMPTON.

1849.		
Nov. 8	Dr. Soltau .	. Introductory Address—Popular View of the Progress of the late Epidemic in this Town.
22	Mr. A. Rooker .	. Alfred and the Anglo-Saxons.
29	Sir W. S. Harris .	. Magnetism.
Dec. 13	Dr. E. Moore .	. Extra and Intramural Interments.
20	Mr. R. F. Weymouth	. The Logic of Geometry.
1850.		
Jan. 3	Mr. Damant .	. The Practice of Architecture in Towns.
17	Mr. Hearder .	. The Electric Light.
Feb. 14	Mr. Wightwick .	. Shakespeare.
28	Mr. P. W. Swain .	. The Primary Forms of Organic Life.
Mch. 14	Mr. A. Norman .	. Architectural Fragments.
28	Mr. L. Jewitt .	. Study of Archæology.
April 11	Mr. Walker .	. Steam—Horse-power and Naval Tactics.
18	Mr. F. W. Gibbs .	. French Law of Inheritance.

SESSION 1850–51.

PATRON.

THE RIGHT HON. THE EARL OF MORLEY.

PRESIDENT.

MR. J. N. BENNETT.

VICE-PRESIDENTS.

MR. A. ROOKER. DR. SOLTAU. CAPT. WALKER, R.N.

TREASURER.

MR. J. L. COLLEY.

SECRETARY.

DR. E. MOORE, F.L.S.

CURATORS.

Library—MR. A. NORMAN. *Apparatus*—SIR W. S. HARRIS, F.R.S.
Museum—MR. L. JEWITT, F.S.A. *Athenæum*—MR. A. H. BAMPTON.

1850.			
Oct.	10	Mr. J. N. Bennett	Capital Punishment.
	17	Rev. S. Rowe	History Principles and Characteristics of Christian Architecture.
	24	Mr. D. Derry	Prison Discipline.
	31	Mr. R. F. Weymouth	The Classical Element in Education.
Nov.	7	Mr. R. F. Weymouth	The Classical Element in Education.
	14	Mr. Alfred Payne	The Age of the Borgias.
	21	Mr. W. Cotton	Cartoons of Raphael.
	28	Mr. J. N. Hearder	Atmospheric Electricity.
Dec.	5	Mr. J. N. Hearder	Atmospheric Electricity.
	12	Mr. L. Jewitt	Costume—Female Head Dress.
1851.			
Jan.	2	Mr. Wightwick	Shakespeare's Merchant of Venice.
	9	Dr. E. Moore	Glaciers.
	16	Dr. E. Moore	Glaciers.
	23	Mr. E. Lane	Zoology and Poetry.
	30	Capt. Walker	The History, Present Condition, and Capabilities of the Harbours of Plymouth.
Feb.	6	Mr. Wightwick	On the Difficulties accruing to a Young Architect on his commencing Practice.
	13	Mr. Rooker	The Koran and its Sequences.
	20	Dr. Soltau	Penitentiaries.
	27	Mr. J. L. Colley	Fine Arts.
March	6	Mr. O. C. Arthur	Architecture—its Study and Application.
	20	Col. Dunsterville	Armies of India.

SESSION 1851–52.

PATRON.

THE RIGHT HON. THE EARL OF MORLEY.

PRESIDENT.

CAPT. WALKER.

VICE-PRESIDENTS.

MR. A. ROOKER. COL. DUNSTERVILLE. DR. SOLTAU.

TREASURER.

MR. J. L. COLLEY.

SECRETARY.

DR. E. MOORE, F.L.S.

CURATORS.

Library—MR. WEYMOUTH. *Apparatus*—SIR W. S. HARRIS, F.R.S.
Museum—MR. JEWITT, F.S.A. *Athenæum*—MR. W. DAMANT.

On the 5th June, 1851, the arrangements for the amalgamation of the Plymouth Institution and the Devon and Cornwall Natural History Society were, after much negociation, completed; and on that day the officers elected at the annual meeting of the Plymouth Institution resigned, and the following officers were elected at the first meeting of the members of the united societies:—

PATRON.

THE RIGHT HON. THE EARL OF MORLEY.

HONORARY PRESIDENT.

COL. C. H. SMITH, F.R.S., &c.

PRESIDENT.

CAPT. W. WALKER, R.N.

VICE-PRESIDENTS.

MR. A. ROOKER. DR. W. SOLTAU. COL. DUNSTERVILLE.
MR. H. TUCKER, JUNR.

TREASURERS.

MR. J. L. COLLEY. MR. J. DABB.

SECRETARIES.

DR. E. MOORE, F.L.S. MR. E. LANE.

CURATORS.

Library—MR. R. F. WEYMOUTH, M.A.
Building—MR. W. DAMANT. *Apparatus*—MR. J. N. HEARDER.
Museum—MR. J. C. BELLAMY (Zoology); DR. COCKS (Entomology); MR. I. W. N. KEYS (Botany); DR. E. MOORE, F.L.S. (Geology); MR. R. OXLAND (Mineralogy); MR. L. JEWITT, F.S.A. (Antiquities.)

1851.

Oct.	2	Capt. Walker	. The Earth—its Rotation and Progression.
	9	Mr. Bartlett	. Tropical and Exotic Productions.
	16	Mr. J. Boswarva	. Iron.
	23	Mr. C. Marks	. The Post Office.
	29	Mr. Alfred Payne	. Some Chemical and Electrical Phenomena of Animal Life.
Nov.	6	Mr. J. D. Macdonald	. The Structure and Properties of Leaves.
	13	Col. C. H. Smith	. Celtic Signa.
	20	Mr. Sargent	. Characteristics of the Saxon Race.
	27	Mr. Lowe	. Tobacco.
Dec.	4	Mr. W. F. Collier	. Plato's Crito.
	11	Mr. E. Lane	. Advertisements from the Times.
	18	Mr. J. B. Cole	. Peter the Great.

1852.

Jan.	15	Mr. R. F. Weymouth	. The Prometheus Vinctus of Æschylus.
	22	Mr. R. Oxland	. The Philosophy of Common Things.
	29	Mr. J. N. Hearder	. Combustion.
Feb.	5	Mr. J. W. Lack	. The Combustion of Coal Gas.
	19	Mr. S. Cater	. The Statutes of Mortmain.
	26	Mr. A Rooker	. The Poetry of the Old Testament Scriptures.
March	4	Mr. W. F. Moore	. Naval Architecture.
	18	Mr. J. P. Mann	. The Wilhelm Meister of Goëthe.
	25	Dr. Cocks	. Marine Botany.

SESSION 1852–53.

PATRON.

THE RIGHT HON. THE EARL OF MORLEY.

PRESIDENT.

MR. ALFRED ROOKER.

VICE-PRESIDENTS.

COL. DUNSTERVILLE. MR. J. N. BENNETT. CAPT. WALKER, R.N.
MR. R. F. WEYMOUTH.

TREASURERS.

MR. J. L. COLLEY. MR. JAMES DABB.

SECRETARIES.

DR. E. MOORE, F.L.S. MR. E. LANE.

CURATORS.

Library—MR. R. F. WEYMOUTH, M.A.

Building—MR. W. DAMANT. *Apparatus*—MR. J. N. HEARDER.

Museum—MR. J. C. BELLAMY (Zoology); DR. COCKS (Entomology); MR. I. W. N. KEYS (Botany); DR. E. MOORE, F.L.S. (Geology); MR. R. OXLAND (Mineralogy); MR. L. JEWITT, F.S.A. (Antiquities).

1852.

Oct.	7	Mr. D. Lowe	Tobacco.
	14	Mr. J. Prideaux	Gold—its History, Properties, Uses, and Prospects.
	21	Mr. T. Harper	The Vascular System of Animals.
	28	Mr. E. Lane	Thoughts upon Shakespeare, Milton, and Byron.
Nov.	4	Mr. Hearder	On the probable connection between the Earthquake noticed in this Country in August last, the Movement in the West Indies and Egypt, and an Eruption of Etna.
	11	Mr. E. Lane	Thoughts upon Shakespeare, Milton, and Byron.
	25	Rev. P. Holmes	Moral Philosophy—some Modern Systems.
Dec.	9	Mr. W. F. Collier	Liberty.
	16	Mr. I. W. N. Keys	The Flora of Plymouth.
	23	Mr. James Hine	The Early Ecclesiastical Architecture of Cornwall.

1853.

Jan.	13	Mr. C. Spence Bate	The Fossil Flora of the Coal Measures of the South Wales Basin.
	20	Mr. R. F. Weymouth	Socrates.
	27	Mr. G. Jago	Education of the Poor.
Feb.	3	Mr. J. P. Mann	The Faust of Goëthe.
	10	Mr. W. F. Moore	The Propelling Power of Ships.
	17	Mr. C. F. Burnard	Adulteration of Food.
	24	Mr. S. Cater	The Navigation Laws.
March	3	Mr. L. Jewitt	Heraldry, with Illustrations of Devonshire Families.
	10	Mr. T. D. Lowe	Tea.
	17	Mr. J. L. Colley	Art in connection with the Exhibition of 1851.
	24	Mr. W. Eastlake	Pre-Raphaelitism.

SESSION 1853–54.

PATRON.

THE RIGHT HON. THE EARL OF MORLEY.

HONORARY PRESIDENT.

LIEUT.-COL. C. H. SMITH, F.R.S., &c. &c.

PRESIDENT.

SIR W. S. HARRIS, F.R.S., &c.

VICE-PRESIDENTS.

COL. DUNSTERVILLE. MR. J. N. BENNET. MR. A. ROOKER.
REV. P. HOLMES.

TREASURERS.

MR. J. L. COLLEY. MR. JAMES DABB.

SECRETARIES.

DR. E. MOORE, F.L.S. MR. E. LANE.

CURATORS.

Library—MR. J. BOSWARVA. *Building*—MR. W. DAMANT.
Apparatus—MR. J. N. HEARDER.
Museum—MR. J. C. BELLAMY (Zoology); MR. I. W. N. KEYS (Botany); MR. C. SPENCE BATE, F.L.S. (Geology); MR. R. OXLAND (Mineralogy); DR. E. MOORE, F.L.S. (Antiquities and Fine Arts.)

1853.			
Oct.	13	Mr. J. Prideaux	. Original Plymouth China and its Inventor, William Cookworthy.
	20	Mr. E. Lane	. The Comus and Samson Agonistes.
	27	Mr. C. F. Burnard	. The Food, Structure, & Growth of Plants.
Nov.	3	Mr. C. Spence Bate	. Ivory.
	10	Mr. J. Prideaux	. The Kaffirs.
	17	Capt. Walker	. The Regions about the River Amazon.
	24	Mr. C. Markes	. Ocean Postage.
Dec.	1	Mr. W. F. Collier	. The Drama as a Means of Cultivating the better part of Human Nature.
	8	Mr. J. W. Lack	. Philosophy of Music.
	15	Mr. J. N. Hearder	. Recent Earthquakes.
	22	Mr. S. Cater	. Washington.
1854.			
Jan.	12	Mr. Wm. Hunt	. The Domestic Fowl.
	26	Mr. W. F. Moore	. The Pleasures of Hope.
Feb.	2	Mr. A. Rooker	. Magna Charta and its results.
	16	Mr. G. Jago	. Education of the Poor.
	23	Sir W. S. Harris	. Gravitation.
March	2	Rev. P. Holmes	. Shakespeare.
	9	Mr. T. Harper	. Respiration.
	16	Mr. R. F. Weymouth	. The Decimal Coinage.
	23	Mr. J. Prideaux	. The Red Kaffirs.
	30	Mr. W. Damant	. Architectural Criticism.

SESSION 1854–55.

PATRON.

THE RIGHT HON. THE EARL OF MORLEY.

HONORARY PRESIDENT.

LIEUT.-COL. C. H. SMITH.

PRESIDENT.

REV. P. HOLMES.

TREASURERS.

J. L. COLLEY. J. DABB.

SECRETARIES.

DR. E. MOORE, F.L.S. MR. C. SPENCE BATE, F.L.S.

CURATORS.

Library—MR. W. HUNT. *Building*—MR. W. DAMANT.
Apparatus—MR. J. N. HEARDER.
Museum—MR. T. HARPER (Zoology); MR. I. W. N. KEYS (Botany); MR. C. SPENCE BATE, F.L.S. (Geology); MR. G. DANSEY (Marine Zoology); MR. OXLAND (Mineralogy); MR. W. J. SPRY (Antiquities).

1854.

Oct.	5	Rev. P. Holmes	Recent Advances in Science.
	12	Mr. Roundell Palmer, M.P.	The Turkish Empire.
	26	Mr. E. Lane	Crowds and their Characteristics.
Nov.	2	Mr. C. Spence Bate	The Rise and Progress of Literature in Europe.
	9	Mr. Spry	Astro-meteorology.
	16	Mr. J. N. Hearder	The Electric Telegraph.
	23	Dr. Letheby	Allotropic Forms of Matter.
	30	Mr. A. Rooker	Landmarks of the Constitution.
Dec.	7	Mr. R. Oxland	Philosophy of Common Things—the Sea.
	14	Mr. C. Spence Bate	The Marine Vivarium.

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Jan.	11	Mr. C. Spence Bate	Zoophytes.
	18	Mr. J. Boswarva	The Marine Algæ.
	25	Mr. J. Hine	Ancient & Modern Domestic Architecture.
Feb.	8	Mr. R. F. Weymouth	The Alphabet.
	15	Mr. J. N. Hearder	Electricity.
	22	Mr. Spry	Egyptian Chronology.
March	1	Rev. P. Holmes	The Philosophy of Socrates.
	8	Rev. P. Holmes	The Philosophy of Plato.
	15	Mr. G. Jago	Schools for the Poor.
	22	Dr. E. Moore	The Progress of Epidemics.